THE METAL INDUSTRY
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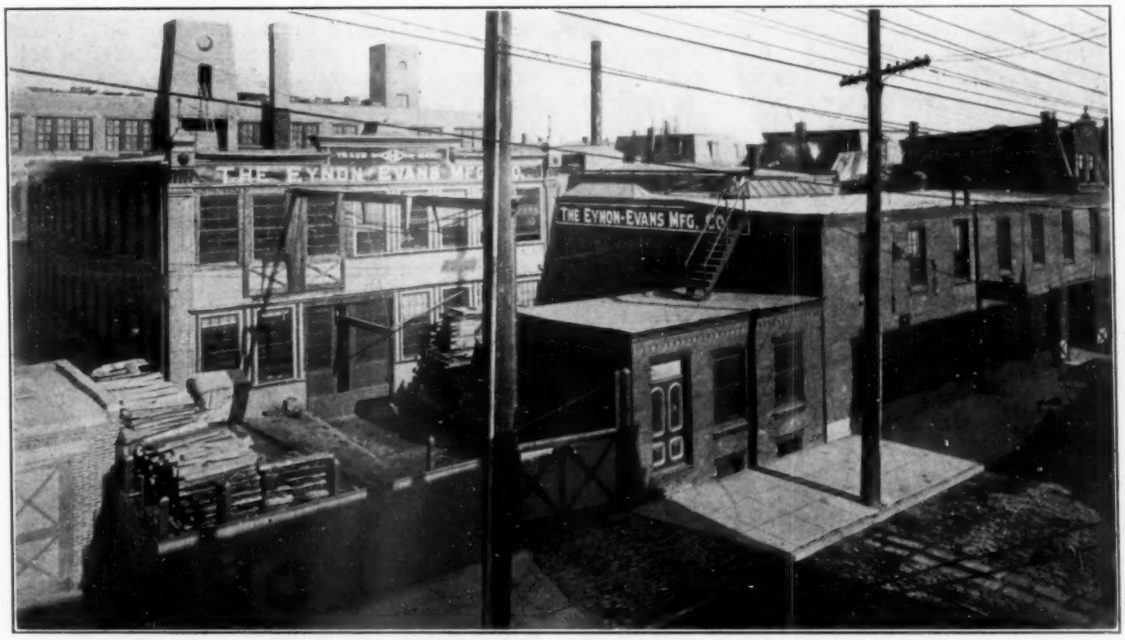
LATEST DEVELOPMENT IN BRASS FOUNDRY PRACTICE

A DESCRIPTION OF THE ADDITION TO THE PLANT OF THE EYNON-EVANS MANUFACTURING COMPANY AT PHILADELPHIA, PA.

"Necessity is the mother of invention." This old axiom is aptly illustrated in the development of the subject of this description of what may be termed a modern, up-to-date brass and bronze foundry, the expansion of which was restricted by available ground space, due to the location and environments. The foundry of the Eynon-Evans Manufacturing Company, on Clearfield street, above Fifteenth street, Philadelphia, Pa., herein described, originally occupied a floor space of 20 x 40 ft. Expansions were made from time to time, but the constantly increasing business demanded more space than was available. It was then decided to erect a three-story modern foundry, the erection and equipment of which was to be carried on without serious interference with the continuous operation of the old foundry department. The building decided upon was of steel frame, brick and heavy mill construction, 50 x 200 ft., on the floor plan, and designed with extra heavy weight carrying capacity. The window area on the various floors is large and permits the daylight to flood the full floor area. The building is served with a 5,000-lb. Albro Clem electric elevator, which travels to the roof level, the winding machine being located in a tower extending above the roof line of the building.



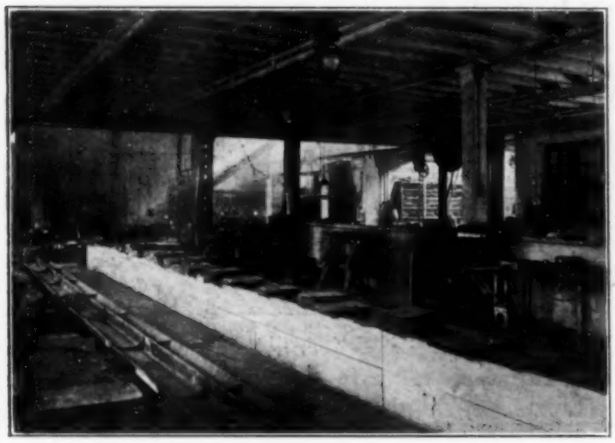
THE PLANT OF THE EYNON-EVANS MANUFACTURING COMPANY AT PHILADELPHIA, PA.

Owing to limited ground floor space for flask storage, the roof of the building, which is protected by the high parapet walls, was made adaptable for flask storage, the full area of the building, 50 x 200 ft., being made available. The roof proper is laid on 6 x 12.4 joists covered with 1½-in. yellow pine planks, on which is laid a 4-ply felt and gravel roofing, this being protected by wooden walks, and the flasks laid either on the roof direct or on special wooden frames. Ultimately it is intended to make an addition, which will serve as a secondary roof to protect the flasks from the weather. The third floor is used for metal storage, preparation of scrap into charging shape, pattern fitting and flask making shop, pattern and general foundry storage departments. The northern half of this floor is used for metal storage; twelve steel bins are located along the wall side, while nine are located along the center line. Each of these bins measure 4 x 6 x 4 ft., and the metal storage capacity aggregates 100,000 lbs. The full floor-carrying capacity is estimated at 200,000 lbs. Industrial railway tracks facilitate the handling of material, carried on trucks in steel tote boxes, facilities being provided for the proper weighing and proportioning of the necessary charges. This industrial track ex-

tends directly into the elevator floor, on which the tracks are depressed, and permits the extension of the tramway system to all floors of the building, as well as to other departments of the plant. A Dings electric separator is conveniently located at one end of the building, power for the same being obtained from an overhead electric motor. Adjoining the elevator shaft a shearing machine for cutting scrap to chargeable length is to be installed. In the southern half of this floor space 25 x 100 ft. is used for a metal pattern fitting shop, with the necessary metal and woodworking machine tool equipment, operated by

FLASK STORAGE ON ROOF OF BUILDINGS.

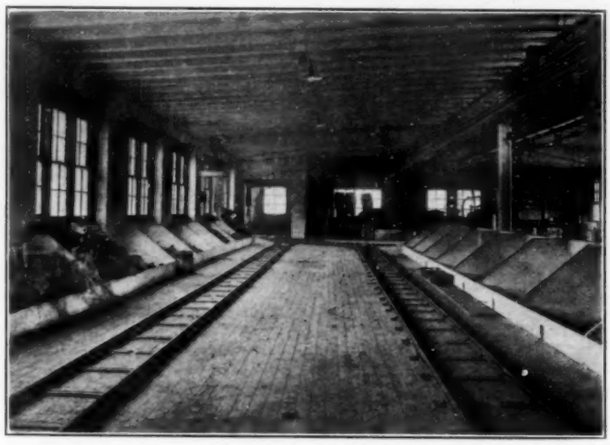
overhead motor driven line shaft. A pipe and fitting storage department occupies, together with the necessary machinery, a portion of this floor, while along the rear wall are steel racks for pattern storage, having a capacity of 600 match plates for molding machine work. This floor of the building is heated by exhaust steam from the machine shop, piped through the center of the floor and supported from the roof rafters. These, it is intended, will be encased, and by means of a fan system, the heat forced to various parts of the room and building. Storage room for linings for the melting furnaces, and various foundry supplies and equipment is also provided on this floor, care being given in the general arrangement to throw weight toward the center and wall lines of the building. Tungsten incandescent lamps are distributed at



MAIN FOUNDRY FLOOR, SHOWING MOLDERS' TABLES AND SPILL TROUGHS.

various points, and at all the machine tools on this floor, in order to provide artificial illumination.

The second floor of the building is entirely devoted to molding machine work, the floor space for which measures 50 x 125 ft., a portion being open in order to provide crane room for heavy work on the first floor. On this floor are located four Tabor molding machines, with provisions for two more. Spill troughs of special design extend across the width of the floor, and have a capacity of 500 standard size 12 x 18-in. flasks. The molding machines are located at the side walls, where adequate daylight is provided by numerous windows. Industrial railways serve the machines, the floor space providing for



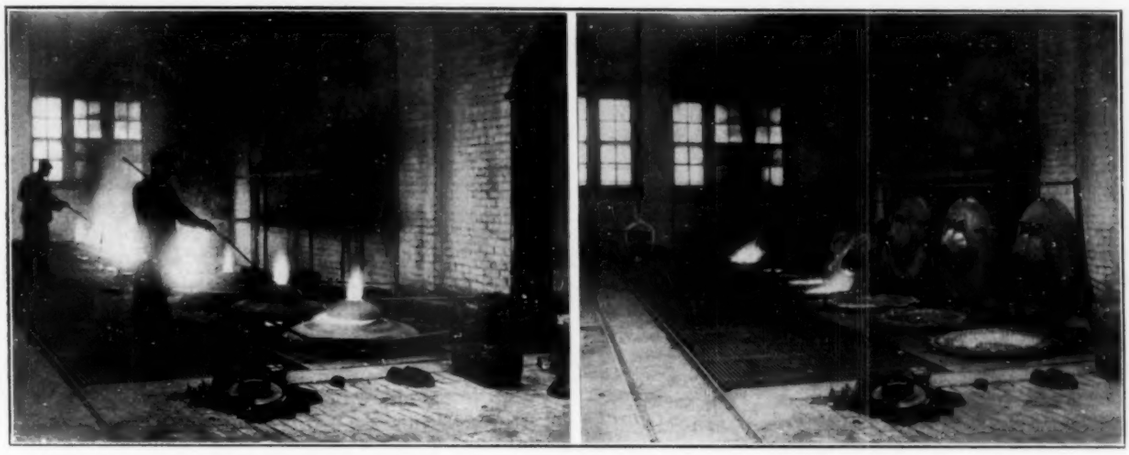
METAL STORAGE BINS ON THIRD FLOOR.

sand and also the removal of castings. Weights for the flasks are stored on a framework, erected over the spill troughs, enabling the molders to handle the same with a minimum effort. Iron tanks, 18 x 60 x 30 ins., containing water for blowing out cores, are suitably located on the molding floor. Overhead hand hoists are used to carry the crucibles containing the metal to be poured, the overhead tramway serving each of the lines of spill troughs. The hot metal is delivered to the second floor by means of a special crucible truck, elevated by means of an electric hoist. This transfer carriage or truck is of special design. The frame is of cast iron, mounted on a four-wheel truck, having 8-in. diameter wheel, the bottom plate extending out over the wheel flanges. The wheels have ball bearings and operate on a 16-in. gauge track. Uprights at the front and rear carry the cradle, which holds

MOLDING ROOM ON SECOND FLOOR.

the crucible containing the hot metal, which, being hinged at the top, the extreme weight below the center line prevents any possibility of the crucible being overturned in transit. After taking the crucible from the melting furnace, it is placed in this carriage and pushed along the tramway to a specially designed electric elevator, encased in a 4-ft. steel cylinder, the tracks in the floor of the elevator cage being depressed and the cage enclosed

both top and sides to prevent anything from dropping into the crucible. On reaching the second floor tongs are again used to handle the crucible, which is carried by the overhead hoists to the molds to be poured. The carriage for the crucible will take in pots ranging from No. 60 to No. 125. Four flaming arc lamps are used for general



OIL OR COKE METAL MELTING FURNACES. THE FIRST PICTURE SHOWS THE LIDS ON, AND THE SECOND WITH THE LIDS OFF.

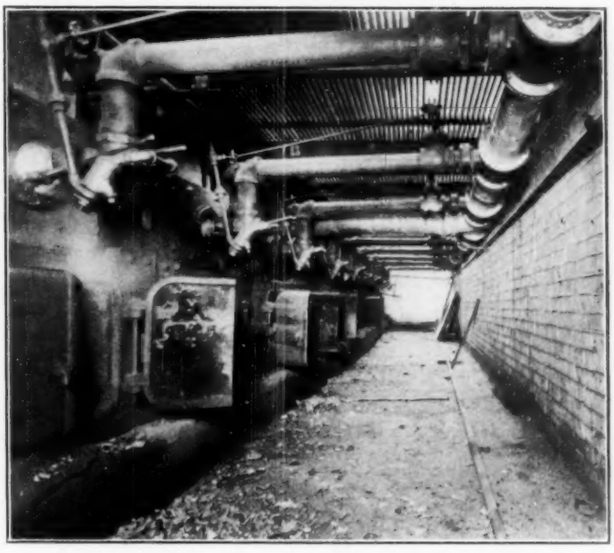
artificial illumination, while individual incandescent electric lights are used at the various molding machines. A 20 x 24-in. heavy steel chute leads from the second floor to the cleaning room on the first floor, and greatly facilitates the handling of castings to that department.

On the first floor is located the main foundry and the melting furnaces; adjacent thereto are the core rooms and ovens, the cleaning room and the mechanical equipment. A floor space 50 x 100 ft. is used for bench work, and approximately the same space for floor work. On the bench work floor facilities are provided for fourteen molders, sheet iron partitions separating the different floors. The floors are of vitrified brick, laid in concrete. Each molder has a specially designed molding table,

STEELE-HARVEY OIL TILTING MELTING FURNACES IN MELTING ROOM.

2 x 6 ft. on top, with an 8 x 16-in. extension. The top is of cast iron an of a grating design, to permit surplus sand to fall through to the floor. Adjusted to the front of the table is a valve mechanism for operating a vibrator when lifting patterns in the molds. A side bracket also provides for the maintenance of a supply of sand, within easy reach of the molder's hand. The spill troughs, shown, are of cast iron, in sections 6 ft. long; the central rib extending about 4 ins. higher than the outside face, enables the flask to be readily placed flat on one end for pouring. The weights for the molds are, on this floor, placed on an upright framework between the floors. Overhead traveling hand hoists serve as a means of carrying the pots from the metling furnace to the molding floors. The space on this floor is given over to the molding of heavy castings is 50 x 100 ft. Here are made castings up to 10,000 lbs. in weight. A pit 10 x 10 x 15 ft. is available for sweep moldings and castings of length necessarily poured in an upright position. A five-ton electric jib crane, having a sweep of 20 ft., serves this molding floor.

Eleven melting furnaces for use either with oil fuel or coke and two oil fired tilting furnaces comprise the melting equipment, and are located in an extension 20 x 90 ft. at the eastern end of the building. The battery consists of four pot fires for No. 80 crucibles, four for No. 125, one for No. 200, and two for No. 300 crucibles, and two Steele-Harvey tilting furnaces for using No. 300 crucibles. The furnaces can be changed from oil to coke fuel if necessary, in a very short time, by simply stopping up the oil



MELTING FURNACE PIT, SHOWING ARRANGEMENTS FOR CHANGING FROM COKE TO OIL FUEL.

inlet and removing the bottom block, which is laid upon the grate bars. When oil fuel is used the crucible in the furnace rests on a deflecting block, which directs and distributes the oil flame and keeps the same from playing directly on the crucible. An underground pit, 7 ft. deep by 40 ft. long, in front of the furnaces, permits ready access, and also facilitates the inspection and making of any repairs to the oil or air pipe lines. The control of the supply of oil and air is through valves set into the grating, which covers the pit. The furnace tops are of cast iron, lined with fire brick, a counter balance weight facilitates the lifting of the tops, while a projecting arm automatically turns the inner face of the lid to the rear, away from the operating side of the furnace when lifted, and thus protects the operator from the excessive heat. Behind the furnaces are the pot racks for storing and drying crucibles. A 3,000-lb. Alfred Box & Company electric traveling crane operated from the floor and traveling the length of the melting department serves the furnaces, being used for the charging and drawing of the pots. An industrial railway serves the furnaces with metal for charging, while also for the transferring of metal by means of the crucible carriage, referred to for the delivery of metal to the second floor. The metal for pouring molds on the first floor is conveyed to the bench molding floor by means of overhead traveling hoists, the system extending directly into the melting department. An average fuel expense using oil in these furnaces is stated to be about 9 cents per 100 lbs. of metal melted, with oil based at a cost of 3 cents a gallon.

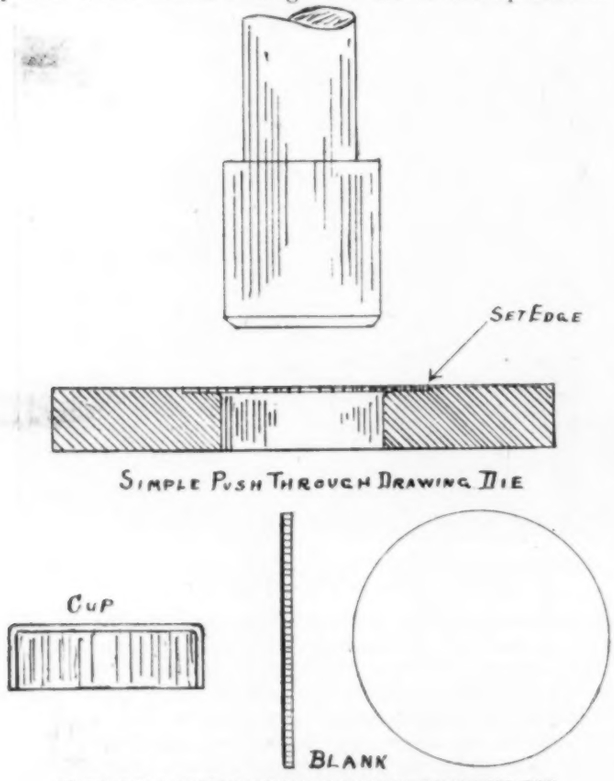
The power equipment for the melting department is located to the right of the melting department. Here two independent sets of blowers and pumps for both oil and air are installed. It is the company's practice to alternately use this equipment each month, thus insuring the fitness for operation of the reserve set should it by any perchance be required. Electric drive is used for both the blowers and the pumps. No. 40 Buffalo Forge blowers, giving an air pressure of 3 ins., are used, while the oil pressure is maintained at 30 lbs. A large area of window space makes all parts of the building extremely bright in daylight. Ventilation in general is obtained from the windows, although additional facilities are provided by the location of suction fans at several points. The roof of the melting department has a ventilated sash and glass hood for the admission of light. The melting capacity of this concern now aggregates 6,000 lbs. per heat, and it has facilities for turning out bronze and brass castings ranging in weight from ¼ lb. to 10,000 lbs., with a molding capacity of 2,000,000 lbs. per year.

SIMPLE DRAWING DIE

THE FOURTH OF A SERIES OF ARTICLES ON THE MANUFACTURE OF DIES. THOSE THAT HAVE ALREADY APPEARED ARE BLANKING DIES IN MARCH, PIERCING DIES IN APRIL, AND GANG AND BENDING DIES IN MAY, 1912.

BY EASY WAY.

This type of die is known as simple drawing, forming, or push through, and is used extensively on shells, cups and thimbles, forming them from a flat circular blank, and can be accomplished on any ordinary punch press with sufficient crank throw to suit the requirements. These dies derive their name because of the fact the circular blank is formed to the shape of the punch while forced through the die at one operation.



PLAN OF A SIMPLE PUSH THROUGH DRAWING DIE.

The die is bored for the outside diameter of the cup wanted, and the top or face of the die is cut to receive the blank and serves as the set edge. The opening in the die is given a draw suitable to the metal used. Some stock can stand more draw than others and not wrinkle or tear. Often a ½-degree draw is sufficient with its upper edge rounded and made very hard and smooth. The bottom edge of the die opening should be made sharp in order that the cup that has been drawn will strip from the punch and not carry back through the die on the return stroke of the press.

Always make this style of die very hard and have the drawing walls perfectly smooth and highly polished. When polishing, use the lateral as well as the circular finish, and this will entirely dispose of all scratches. This type of die when used for drawing very thin metal cups is superior to the combination type or post die where the article is drawn over a post and necessitates the blank ring holder serving as the stripper or shedder in delivering the unit off of the post. Because the stripper would have to be made to a close fit for the drawing post to give satisfactory results. If left a loose fit, the drawn cup would not be stripped off and would remain on the post, allowing the stripper to raise without delivering the cup. If this is not noticed by the operator the results are spoiled work or a broken die, and many times both.

With the push through type the very thinnest of metal can be drawn, for the punch after it has drawn the blank through the die continues downward until a little more than the length of the cup has passed the bottom of the die. The bottom edge of the drawing opening is made sharp, so that when the punch starts on the return or up-stroke the upper edge of the drawn cup or shell, which by now has sprung away from the punch, strikes this sharp edge and the cup is thus stripped from the punch. The shell then drops as finished into a suitable receptacle placed under the press.

(To be continued.)

DECORATIVE EFFECTS ON METALLIC SURFACES

By H. E. Willmore.*

H. E. WILLMORE.

In the competitive system of the times the manufacturer of metal goods recognizes the fact that his wares must be attractive to the eye to compel sales, and that the general appearance of a metal article greatly affects the disposal of his goods. So the chemist and electroplater have co-operated with the manufacturer in developing ornamental effects which not only increase the beauty but also the durability of his output. The growing human desire for luxury in living demands that the most trifling things shall be in harmony with the surroundings, and the electroplater's work stands out prominently in the general scheme, from the wholly artistic in jewelry and shelf ornaments, to the wholly utilitarian articles such as cooking utensils, bicycles, typewriters and builders' hardware. In the latter, one would imagine the limit had been reached in the plater's art, and it probably calls for a greater general knowledge of plating and finishing than any other line. The plater on this class of work must possess a thorough knowledge of the gold, silver, nickel, copper, brass, bronze, tin and zinc solutions, and must also be able to decorate these metals both solid and deposited in an artistic manner, and the effects demanded and produced are equal to those seen on the most costly ornaments. But in devising a system of coloring, it should be such that the metallic character is always in evidence, and no medium should be used for the coloring of metals, but what would have the appearance of being a part of the metallic construction, or in other words, it must be of a chemical or electrochemical nature, preserving or suggesting the metallic body. The art of metal coloring is constantly widening, and its application becoming more extensive, and the object of this article is to describe some of the methods of producing ornamental surfaces by mechanical, chemical and electrolytic means. The coloring processes apply equally to the solid or electroplated article having the same metallic surface.

The mechanical means used is mostly preliminary or preparatory to the others, and is embraced in grinding, polishing, buffing, sandblasting, scratch-brushing and scouring; and in some instances is all that is required, as in the case of polished iron, steel and brass, also in the finishes known as ship brass or wheel finish. But if the finishing of metals should stop here, there would be no place for the electroplater in the metal manufacturing industry. The chemical is probably the most important of the means used for the finishing and coloring of metals. It is always preparatory to, and usually the final means used in, the decorative scheme. It produces the dips and pickles, compounds the plating solutions, and is the means by which the various colors are obtained. The electrolytic process is the treatment by which we coat one metal with another by the aid of an external source of electricity passing through a solution of the salts of the metal to be deposited, giving the baser metals an ornamental and protective coating of metal of higher value. I have in my sample cabinet in the department of which I have charge, over 150 finishes, and this by no means exhausts the possibilities along these lines. These finishes were all produced by the mechanical, chemical or electro-chemical means just described. Mechanical treatment is always a basis for further manipulations, and the finished product is largely dependent on how carefully and skillfully this operation has been accomplished.

In the coloring of metals it should be the aim of the operator to produce on the surface natural effects, as produced by exposure to the atmosphere. The order in which the colors are formed are: First, the slight discolorations, following with the browns and blacks to the more antique greens. Any of the shades are useful for ornamental purposes, but must be preserved by a coating of lacquer. In all operations for the coloring of metals it is of the utmost importance that the surfaces be mechanically and chemically clean, for upon this depends the uniformity of color. In the chemical production of colors on metals the sulphides are of the greatest value, the sulphides of potassium, barium, ammonia, arsenic, and antimony being the agents most commonly used, although the oxides, acetates, sulphates and chlorides of some of the metals are excellent staining mediums, each producing colors peculiar to itself. I will state here that while the chlorides produce some very beautiful shades of color, in some instances their use is not recommended, as under the influence of light they are not of a permanent character, usually becoming darker and finally black when exposed to its rays. Scratch-brushing, when used with an abrasive, gives a very attractive finish upon metals that have not been chemically colored. A good example of scratch-brushed, uncolored metal is the finish known as "Lemon" or "Brush" brass. This finish is produced by applying to the revolving scratch-brush ground pumice moistened with either oil or water. With reference to chemically colored surfaces, it may be said that, in general, scratch-brushing produces softer tones and more delicate shading than any other treatment. Specially constructed scratch-brushes are also used for producing the satin finish effect on silverware and jewelry where the sandblast is not available. Another method of obtaining the satin finish is by the matt dip. This is usually composed of equal parts of sulphuric and nitric acids, saturated with metallic zinc and used hot. Some platers vary the proportions, depending on how fine or how coarse they prefer the matt.

The methods of imparting colors are so many and so varied that it is entirely without the scope of this paper to do more than just touch upon a few of them. The electrochemist takes especial pride in developing new shades and colors, until it is possible to produce on metallic surfaces all of the fundamental colors and a great variety of shades between them, as well as the non-colors, black and white. Of the metals, copper lends itself most readily to the process of coloring, although the others come in for their share. Thus copper when passed through a solution of potassium or ammonium sulphide will assume a series of colors from straw yellow through red and blue and purple to the final black, the colors depending on the density of the solution, the temperature and the time of immersion. And it must be understood that in all coloring operations these conditions must be taken into consideration; especially is this true in duplicating certain shades. By subjecting the colored articles to further mechanical treatments, a great many pleasing effects may be obtained with the copper sulphide alone. Thus, if the articles are relieved or "spotted" with the cotton buff, they present one appearance, and if relieved with the scratch-brush another, and so on. This is the finish known as "oxidized" copper, which is in reality sulphidized copper. The potassium sulphide or liver of sulphur, as it is more commonly called, also imparts certain shades to bronze, but has very little

*Foreman Plater, Chicago Hardware Company, North Chicago, Ill.

shades on this metal other solutions must be employed. Those mostly used are the carbonate of copper and ammonia dip, the arsenic and hydrochloric acid dip and the black nickel solution. A great variety of effects can be produced by the use of these solutions and the employment of the sandblast, scratch-brush and ground pumice. The brown shades on brass are produced by the sulphides of arsenic and antimony dissolved in a caustic alkaline solution, such as the sodium or potassium hydrates. Blues are obtained with acetate of lead and hyposulphite of soda.

In the evolution of colors by time's corroding effects the greens come last, but are by no means the least beautiful of metal's colorizations. There are several means for their production and consist mostly in either applying to the surface or by steeping the metal in a solution of corroding agents, the most active of which are sal ammoniac, common salt, acetic acid, copper sulphate, copper nitrate, and zinc chloride. By different combinations and proportions of these corroding agents all the different shades from the patinas to the more deeply corroded verde antiques can be obtained. Another method is to produce them electrolytically, with the reverse current, in a bicarbonate of soda solution saturated with hydrogen gas; and still another by imbedding the article in sawdust moistened with a solution of the corroding salts. I recently produced and exhibited samples of forty different shades of green finishes in varying stages of corrosion. An important item in producing the antique greens is to see that the corrosion proceeds slowly and glycerine is usually added to the agent to prevent its too rapid drying.

It exerts considerable influence in coloring or ornamenting metals as to whether they are cast or rolled, as in the case of crystallized brass or bronze finish. This finish will only apply to articles of cast metal, as the crystalline structure of the metal is destroyed in the rolling process. Some time ago in producing this finish on some cast door knobs, I had the experience of noting how easily the crystals can be prevented from appearing. Around the outer edge of the knobs, where the turning tool had exerted an extra hard pressure, there were perfect circles that it was impossible to crystallize, while the other portions of the knobs were finely crystallized. The method I have found best adapted for producing this finish is to make it the anode in a sulphate of copper solution, although there are several dips that give good results. It will also be found that cast and rolled articles of the same metal do not always assume an identical shade when immersed in the same coloring dips. Whether this is due to a difference in the composition of the metal or its structure would be hard to determine without a chemical analysis.

It will be seen from the nature of the methods employed in obtaining the various colors that the colors produced depend upon the chemical compound formed upon the surface and the thickness of the compound. Nickel and silver are not subject to such a variety of color changes as are copper and its alloys, but by combinations of chemical and electrolytical processes and by subsequent treatment very delicate contrasts of grays and whites and black and white may be obtained upon nickel by the use of the black nickel solution; also by a solution of the sodium arsenate, afterwards being relieved with ground pumice made into a paste with water and applied to the scratch-brush. The French gray and black finishes on silver are obtained by the potassium sulphide solution; also by platinic chloride. The browns by a solution composed of sulphate of copper, sal ammoniac, acetic acid and water, and green is produced with a solution of iodine and potassium iodide. These colors can be relieved as best suits the taste of the colorer. Gold is a metal that needs no beautifying, and aside from its value is an attractive metal as regards color. It does not oxidize in the air, nor do sulphurous fumes tarnish it. The atmosphere makes no perceptible change in its color. The different shades of gold as seen on jewelry and other articles of metal are not due to a superficial coloring of the surface, but to the solution from which it is deposited or in the manner of its preparation before immersion in the electrolytic bath, and no surface coloring of metals can equal the beauty of gold in its different degrees of fineness or the tones of color known as Roman, rose, Mosaic, and green gold.

An important item in connection with the coloring of metals is the preservation of the finish by a protective coating of transparent lacquer, and judgment must be used in the selection of one suitable to the finish to be coated. For instance, a glossy lacquer should never be used on an antique finish; neither should a satin finish lacquer be applies to highly polished surfaces, and a sandblast finish has no value when it is made to look as though it had been coated with a cheap furniture varnish. The lacquer manufacturer has done his part towards providing a lacquer suitable for every purpose, but they must be used intelligently. In lacquering the verde antique finishes the spray is by far the better means of applying it. It should also be remembered that if the lacquer used on these finishes has too much body, the article will present a painted appearance. In some of the green finishes waxing is preferable to lacquering, and again in some instances a combination of both is desirable. As Dr. Jones† once said, the best method of using lacquers is to mix them with brains and apply them with enthusiasm.

From what I have said, it must not be implied that a novice can take a given formula and produce the best results. The coloring of metals is not simply a mechanical operation to be practiced by one who has not the slightest idea of color values. Inharmonious contrasts are usually the result of inexperience. It is the eye for color of the manipulator, the correct idea of the fitness of things, the appropriate shades best adapted to bring out the details and lines of the article operated upon, as by a system of shading and relieving the high parts of a fancy design are made more prominent and the background put more deeply into the shadow. These are the things that prove the artistic sense and skill of the electroplater and finisher. In conclusion, I would say, the best formula for producing results is practical experience, technical knowledge and good judgment in about equal proportions.

†Wm. A. Jones, Celluloid Zapon Lacquer Company.

TESTING THE PURITY OF ALUMINUM.

Like mankinds, there are "all sorts and conditions" of aluminum. That which we find in the open market often contains silicon and iron. The exact determination of the presence of such impurities is possible only by chemical analysis. Mierzeinsky states that as a rule when foreign metals are present, the aluminum is hard and brittle; 5 per cent. of iron or copper makes it almost unworkable; 10 per cent. of copper makes it as brittle as glass, and causes it to blacken in the air. With 50 per cent. of silver it remains perfectly workable, and takes a beautiful polish; with 10 per cent. of gold its malleability remains unchanged, but its hardness is increased. The addition of 0.1 per cent. of bismuth makes aluminum so brittle that it is unworkable even after annealing.

ROBERT GRIMSHAW.

ZINC LOSSES*

By W. H. Bassett.†

A considerable loss in the brass manufacturing industry arises through the volatilization of the zinc in process of melting and alloying. This loss owing to want of reliable statistics cannot be even approximately estimated.

The copper losses in most of the more progressive manufacturing establishments are very small. These have not been difficult to take care of, but the zinc losses, on the other hand, have presented a much more difficult problem on account of the volatile nature of the metal.

Zinc melts at about 420 degs. C. and boils at about 930 degs. C. Copper melts at about 1,080 degs. C. and, in making brass, has to be sufficiently heated to take the zinc without chilling before it is all added. Brass for working is poured into iron chills, and must be sufficiently hot when cast to give a smooth surface free from cold sets and other flaws. On this account the pouring temperature for high brass is about 1,050 degs. C. The melting point of the alloy copper 70 zinc 30 is given by Charpy as 945 degs. C., and that of the alloy 60 copper 40 zinc as 880 degs. C. Two and one brass melts at approximately 920 degs. C., that is, very nearly at the boiling point of zinc. It is consequently evident that, when most of the brasses are sufficiently fluid to pour freely, the zinc is rapidly distilling from them.

The actual loss of zinc in flue dust and in zinc fumes which pass into the atmosphere in the melting and casting of brass for rolling, amounts to approximately 6 per cent. of the zinc used.

Most commercial brands of zinc carry both lead and cadmium. Either of these elements may run as high as 0.75 per cent. in the common brands used in brass-making. The cadmium in the Western brands average 0.30 per cent. to 0.50 per cent.

The composition of the flue dust from the fires in which brass is melted is interesting, as it indicates a much more rapid volatilization of cadmium and lead than of zinc. Samples taken from flues in the casting shops of two different mills gave the following composition:

	"A" Per cent.	"B" Per cent.
Copper oxide	2.85	2.50
Iron oxide	2.43	....
Zinc oxide	32.13	24.74
Cadmium oxide	1.56	0.89
Lead oxide	0.31	1.92

Per cent. cadmium oxide amounts to 4.9-3.6 per cent., respectively, of the ZnO present.

In some instances we have found 6 per cent. as much cadmium oxide as zinc oxide. A search for cadmium in sheet brass made from zinc carrying ½ per cent. of that element failed to reveal an amount sufficiently large for determination, indicating that in ordinary practice the cadmium is substantially all volatilized.

Part of the zinc lost by volatilization remains in the fluxes mixed with fine ashes as flue dust and part goes off into the atmosphere. Numerous suggestions have been made for the saving of all of the zinc oxide, but none of these have seemed likely to succeed commercially on account of the expensive plant required and the low value of the recovered material. It is practically impossible to get enough for the flue dust to pay for the transportation charges. Apparently the better grade of material is now lost into the atmosphere, and if this could be recovered the total product might be of higher quality.

One of the reasons for the difficulty in recovering the zinc fume is the great dilution of the flue gases, caused by opening the furnace to add to the charges in the crucibles and to work the material down into pots. The new idea of separating solids from flue gases by means of an electrical discharge, which has been worked out by Professor Cottrell, appears to be a possible solution of this problem. It also appears that zinc is decidedly volatile and escapes from its alloys at temperatures considerably below its boiling point. On a number of occasions white deposits, which proved on analysis to be zinc oxide, have been observed on the annealing pans. This occurred when the temperature of the heat treatment had not been above 500 degs. C. during the operation.

It has also been frequently noted that strips of copper or copper colored alloys heated in loose contact with brass became brass colored and, in fact, that the surface of copper would be changed to brass for a depth of 0.2 to 0.3 mm. On account of these observations the following experiment was undertaken: Pieces of hard rolled brass made from 2 parts copper to 1 part zinc 2.5 cm. × 12 cm. × 0.1 cm. were wrapped in thin sheet copper and packed with fine charcoal in a sealed copper pipe, and heated in a Sauveur furnace for one hour and for 10 hours. At 350 degs. C. and at 450 degs. C. there was no apparent loss. At 550 degs. C. the loss was 0.3 gram per square meter of surface exposed in ten hours. At 650 degs. C. the loss was 1.5 grams per square meter in one hour and 5.4 grams per square meter in ten hours. At 750 degs. C. it was 46 grams per square meter in one hour, and 63 grams per square meter in ten hours. The copper envelope, in the heats where there was noticeable volatilization of zinc, was changed to brass on the inside surface. This means that soft brass 15 mm. thick in the usual processes of annealing in being reduced to thin sheets has lost about 1.3 per cent. of its weight, due to the volatilization of zinc. In other words, 4 per cent. of the zinc in the brass is lost by volatilization. In annealing, as it is usually carried out in the open furnace, the loss is greater on account of oxidation. Since the annealing is done at varying temperatures, it is difficult to estimate this loss, but it is probably not far from 3 per cent.

The use of chlorides as fluxes in melting promotes the volatilization of zinc. The action of vapors of common salt at temperatures considerably below the melting point of brass will completely dezincify the alloy. This is illustrated by the following experience: Brass 2.5 mm. thick was heated for one hour at approximately 650 degs. C. in a wood-fired annealing furnace with wood which had been soaked in sea water. The result was that all but 0.2 mm. in the center was completely dezincified, had the color of copper, and cracked apart when bent. A similar experience was had through the accidental placing in the annealing furnace of the heads and staves of an old salt barrel.

The residue and slags from the casting shops generally find their way back to the copper smelter, and, in the process of smelting, all of the zinc which these contain is lost. This loss amounts probably to a little more than 1 per cent. of the total spelter consumed in the manufacturing of wrought metals.

Taking all of these sources of loss together, it seems

*A paper read at the annual meeting of the American Chemical Society, held in Washington, D. C., December, 1911. The paper was published in The Journal of Industrial & Engineering Chemistry, March, 1912.

†Assistant superintendent and metallurgist, American Brass Company, Waterbury, Conn.

probable that fully 10 per cent. of the spelter used in making wrought brass is at present a total loss. In the cast brass industry, in spite of the fact that the alloys used generally contain but a small proportion of zinc, the losses must be very large on account of the use of small oil reverberatory furnaces of various types and also crucible melting furnaces which have been devised more with an idea of convenience than of preventing metallurgical losses.

DISCUSSION.

MR. PARSONS:

In order to start this discussion, I will bring out one or two points that have impressed me, and I hope a good many others in the audience will have something to add. One of the first things of prime importance is to remember that most of the zinc which is mined each year is ultimately wasted. Copper, platinum, gold, or metals of that character are to a great extent stored up and accumulated and used over and over again. Probably this is less true of zinc than of any other of our important metals. For example, there are now about 59,000 tons of zinc oxide made each year and used in paint, rubber goods, and some other industries, practically none of which is ever recovered. I understand that the automobile industry is using at the present time approximately forty million pounds of zinc oxide as a filler for automobile tires.

Approximately two-thirds of all the zinc produced is used in galvanizing iron. Now that zinc, while it preserves the iron, is for the most part ultimately lost; the iron may be recovered as scrap, but little zinc is recovered from galvanized iron.

There does not seem to be much prospect of very great recovery as long as the price of zinc is low. Also in the mining of zinc there is fully as much loss as in the mining of carbon. Immense amounts of zinc are left in the ground, simply for the reason that a royalty is charged on the basis of the zinc mined and the producing companies naturally take out of the ground only that part which can be readily disposed of, and leave in the mine that which does not immediately pay them. Later the mine is covered up, filled in, and abandoned, and that part of the zinc left in the ground has little probability of ever being recovered.

Also, the peculiar chemistry of zinc—its volatility, the difficulty of its condensation when mixed with inert gases, the ease with which it reduces carbon dioxide at temperatures but little above its boiling point—makes losses in the smelting of zinc almost inevitable.

Now in the brass industry, from 7 to 10 per cent. of the zinc used is wasted. In Waterbury alone there are probably 7,500 pounds of zinc in the form of zinc oxide passing out of the chimneys every day. Such scrap as cannot be directly melted in the brass industry goes to a smelter in New Jersey, and if I am correctly informed as to the methods they use, the copper alone is saved. They use reverberatory furnaces with oxidizing flame, and the zinc oxide accordingly passes off into the atmosphere and is wasted.

The Geological Survey estimates that probably something like $45,000,000 of metal scrap are produced each year. These figures, as I understand them, include all scrap, both that of definite and known composition which by simple remelting can be readily used again, and that of varying and unknown composition, such as is obtained through junk dealers. In the first case, there is very little waste of material, and I am personally doubtful if it should be considered "scrap" at all, for it is simply remelted to be used again in much the same way as the dough from which doughnuts are cut is again kneaded together and rolled out into sheet for further use. Even here, there is, however, a considerable loss of zinc in the remelting in crucibles, which has to be made up by the addition of more spelter. With true scrap picked up as junk the case is quite different. This is remelted in reverberating furnaces for the copper alone, and the zinc passes off with the waste gases. It is impossible to accurately estimate this loss at the present time, but I know of one company that recovered 2,000,000 lbs. of copper last year from this kind of material, the corresponding zinc going to waste. The whole of this material formerly went to waste and it was some time after the waste was known before the chemist of the company could persuade the managers to let him have the necessary apparatus to recover it. It is recovered by Wifley tables, and the chemist mentioned told me that they saved $40 the first day their experimental table was installed, and $80 the second day. After that he could not buy tables fast enough to suit the management. I speak of this particularly to bring out the fact that chemists often have other problems than scientific ones to solve, namely half-hearted support from those in control.

MR. ITTNER:

The loss in the brass industry seems to be considerable, and most of it appears to be due to volatilization and oxidation. I would like to ask if it is not possible to prevent a large amount of this volatilization by simply confining the zinc during the melting process. I am not in the brass industry at all, but I have to deal with some other liquids which are more volatile than zinc, and I find that we can prevent losses by confining these liquids. If you put water in an open dish and heat it, you know that the water volatilizes; but if you confine it by a tight cover, you can heat it up to the boiling point, and over the boiling point, and not lose the water. If you want to heat it to the boiling point and do not want to have pressure, you can connect the dish with a tube, so that the pressure may be relieved.

Therefore, if zinc is lost, I would like to know why they cannot melt it in closed vessels, and if necessary to relieve any possible pressure, connect tubes with these vessels so that zinc, if it is distilled off, can be collected as metallic zinc or as oxide.

MR. DOREMUS:

A great saving of metallic zinc is effected by the substitution of dynamos for primary batteries. At the Western Union offices at the corner of Dey street and Broadway, N. Y., there were some 30,000 primary cells in use before the introduction of dynamos. Not only was the zinc sulphate thrown away, but also most of the metallic zinc left as stubs.

A demonstration of the melting of metallic lead was given the other day in New York, using the "Bonecourt" system of surface combustion. The heat is applied internally. An explosive mixture of gas and air is fed, under slight pressure, into an iron pipe of 1½ inches diameter, which passes down to the bottom of the melting pot, where it is united by a couple of right-angle elbows to a three-inch upright iron pipe. At the bottom of the upright pipe a plug of non-conducting material is placed, having a central hole through which the gaseous mixture passes. Broken pieces of porous contact material are placed in the three-inch pipe above the plug and the combustion of the gaseous mixture is confined to the space occupied by these pieces. The heat is applied below the surface of the molten lead and when the walls of the melting pot are suitably insulated there is great economy in the consumption of gas. The apparatus is applicable not only to the melting of lead, but also to that of type metal and other alloys.

MR. BUELL:

We have had considerable experience the last few years in trying to hold down the zinc losses and recover the oxide from the furnace gases. We have tried a good many devices and spent a good many thousand dollars without getting results which were of enough value to use, and so appreciate the desirability as well as the difficulty of the subject.

Most of the devices that have been used and suggested for recovering zinc oxide are such as are hard to use in connection with foundry work where the making of brass is the prime object, and recovery of the zinc oxide a secondary consideration.

With most of the methods, efficient modifications in the control of the furnace are necessary and this usually works to the disadvantage of the brass.

I am hoping to hear of the work which Professor Cottrell has done in regard to reclaiming such material from the chimney gases, and I agree with Mr. Bassett that this process of Professor Cottrell's promises to be a solution of the present difficulty.

MR. PRICE:

I should like to say that under the present condition of melting brass by means of coal, it would not pay to recover these zinc oxide fumes, because they are so contaminated by dirt and ashes. The only means of attacking that problem would be by means of producer gas or oil furnaces, or the solution may come some day by means of electric furnaces. I do not think it is practicable, under existing circumstances, to distil the zinc oxide fumes. You could not confine them under the operations of manufacturing practiced at the present time.

MR. ERICSON:

I am chiefly interested in the losses in zinc smelting, and it

varies between 8 and 22 per cent., depending on the character of the ore. In regard to recovering zinc once used, it must be remembered that practically two-thirds of all spelter made is used in galvanizing, and consequently it covers a very large surface area, which, in connection with the cheapness of the metal, makes de-zincing impossible, such as is possible with tin, a very much higher priced metal.

In reference to electric zinc smelting, I will say that there are at present two electric zinc smelters in operation in Scandinavia, both working under the DeLaval patents, one at Trollhättan, Sweden, and the other at Sarpsborg, Norway. The cheap water-power available makes them possible, after the technical difficulties have been overcome, and I do not believe that electrical energy generated from coal has any chance in the near future to supplant the present retort practice.

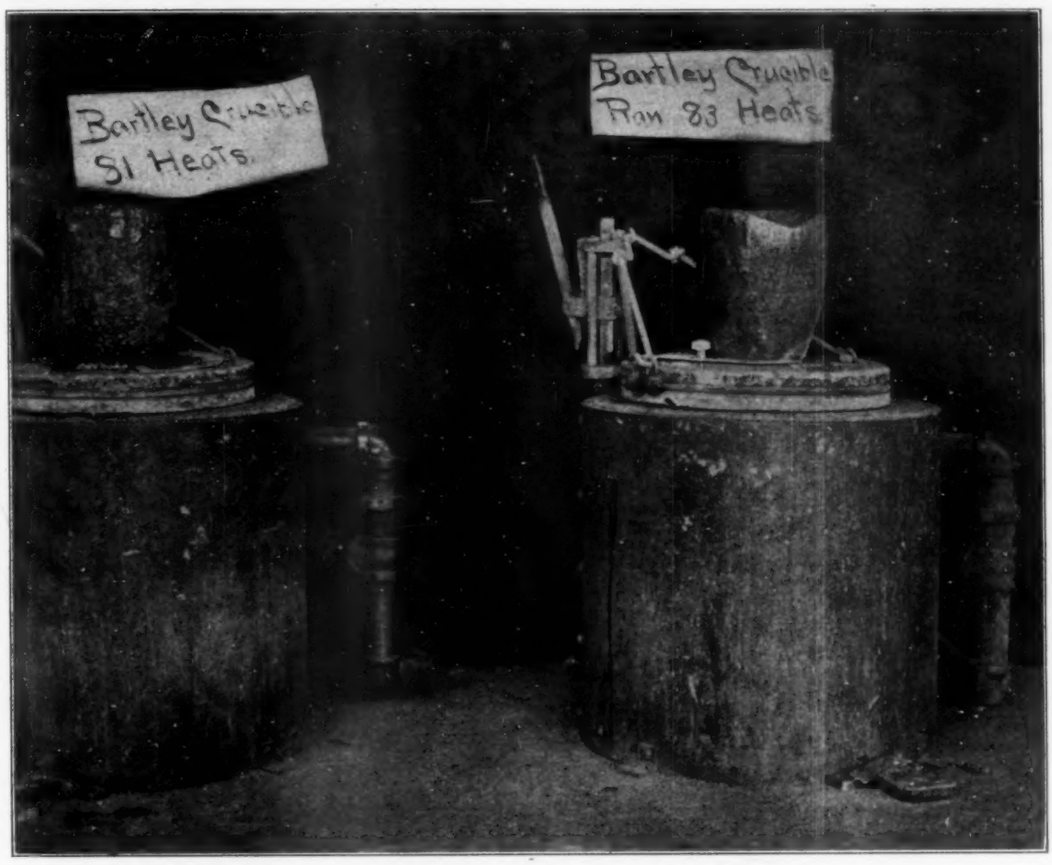
However, I have been informed that the plant at Trollhättan has contracted for 10,000 additional horsepower for enlargement. The difficulty with electric smelting with ores tried so far is that the recovery on the zinc content is so low that it can be applied only to cheap complex ores, and that a second distillation is necessary before a high-grade spelter can be obtained.

MR. GREY:

I cannot agree with the gentleman that the furnaces are not satisfactory for condensing zinc. A few years ago we had a loss of 200,000 pounds of copper out of 5,000,000. By increasing our dust chamber capacity we cut the loss down 50 per cent. You could not go below 50 per cent., because the sulphur would be converted into sulphuric acid and ruin your dust chambers. They would fall down some day after the gas was cold.

MR. PARSONS:

You will be interested to know that the Bureau of Mines is planning to take up the question of electric furnaces for these non-ferrous alloys. The problem is one of the greatest importance in the conservation of waste, for it strikes at the basis of the whole difficulty in zinc losses in alloy manufacture. The vapor pressure of pure zinc, of course, reaches atmospheric pressure at its boiling point, which Mr. Bassett has just given as about 930 degs. When zinc is diluted with copper, the temperature necessary for the mixture to "boil" will of course be greatly increased. Zinc losses now occur, as Mr. Ittner has indicated, simply because the melting is done in crucibles or other open containers, over which a current of air or flue gases are passing, giving every possible aid to the volatilization and oxidation of zinc. It is not at all surprising that zinc will sublime from brass under such conditions at 500 degs. or even lower. It is exactly the same situation as the well-known evaporation of water at temperatures even below its freezing point when freely exposed in open vessels. Neither zinc nor water will evaporate below their boiling point if kept in closed vessels at atmospheric pressure, and of course the boiling point of zinc is raised by the addition of copper exactly as the boiling point of aqueous solutions is raised by the addition of a non-volatile solute which under certain conditions may combine with it. Accordingly, an electric furnace properly enclosed and so constructed as to overcome other difficulties, of which there are many, would be ideal. The cost of fusion would be high, but other advantages, such as large units, easy stirring, low labor cost, non-intermittent firing, saving of zinc, etc., would, in my opinion, more than compensate. I personally believe that the object to be striven for is a closed furnace, and it now looks as if this would ultimately be accomplished through the use of electricity.



AN EXAMPLE OF LONG-LIVED CRUCIBLES.

The above photograph shows two crucibles which ran 81 and 83 heats respectively, being used on brass. The crucibles were manufactured by the Jonathan Bartley Crucible Company, Trenton, N. J., and the melting was done in No. 50 Monarch gas furnaces made by the Monarch Engineering and Manufacturing Company, Baltimore, Md., at the foundry of the Ohio Brass Company, Mansfield, Ohio. We are indebted to Frank Hein, assistant foreman, for the photos.

MR. FLOWERS:

Another loss in zinc, which is perhaps not noticed by most chemists, is in the illustrated literature of the country, which is printed from zinc plates. As far as I know, outside of a few cents obtained for the scrap metal, the zinc consumed in etching these plates is never recovered.

MR. LANGMUIR:

It seems to me we should not only discuss the waste of zinc, but also the waste of the health and lives of the workmen from the zinc fumes.

MR. BASSETT:

It seems to me that if we can get some kind of electrically heated furnace with the electric discharge for condensing zinc fumes and obtain power cheap enough, we will be making great strides toward the end sought for.

The effect of zinc fumes on the health of the casters, in the ordinary casting shops, at least those connected with the wrought brass industry, is not any more harmful to health than is the use of tobacco. Throughout the large mills of Connecticut you will find as fine looking men engaged in casting brass as you can find in any trade where the work is carried on in intense heat. They are mostly big, husky men who enjoy life to a good old age, and do not seem to mind the effect of the zinc. Occasionally there are men who do not seem able to stand the work, the same as in any trade where work is severe and hot, but in almost every instance the casters of brass are healthy and apparently not injured in any way by the zinc fume which, to people who are not accustomed to it, is quite troublesome. A certain zinc company in starting a new plant found great difficulty in getting help that would work in the bag room, because a considerable amount of zinc oxide was carried into the atmosphere. The laborers, who were unusued to zinc, were troubled with the chills, fever and nausea that go with acute zinc poisoning, and would not stay at work until they had become accustomed to it. The company offered each man who worked a month's pay bonus. This resulted in a number staying to collect the extra pay, and as they soon became accustomed to the zinc the difficulty was overcome. The trouble with zinc is soon over and one becomes immune.

With regard to the recovery of the zinc that is distilled off, Mr. Price has answered that question fully. The brass industry has been carried on for more than a century in Connecticut. The industry was imported from England, and considerable study has been given the matter of zinc loss, but up to date we have been unable to find any way to overcome it. We hope that the work that has been done by the United States Bureau of Mines will help us.

So far as protecting the metal from the currents of air which may sweep away the zinc and produce extra volatilization is concerned, I think that this is now done thoroughly by a good heavy covering of charcoal. Of course, without the covering of charcoal, the zinc would be much more rapidly lost. The temperature at which the brass is cast, and the loss of zinc on that account is something that we are unable to control.

I think there is no industry getting out sheet metal, wire, rods, tubes and other articles of that kind, where the perfection of the product required is as great as it is in the brass industry. The brass manufacturer, for instance, is obliged to get out brass for the maker of cartridge shells, which brass must be absolutely perfect. The practices in use in the brass mills making this material are those which have been found by experience to give a product that will meet these requirements.

ELECTRIC ZINC SMELTING AND REFINING FURNACE

A DESCRIPTION OF A FURNACE ADAPTED FOR THE RECOVERY OF ZINC FROM BRASS AND GALVANIZING FURNACES.

There is established at Hartford, Conn., a plant for the treating of products containing zinc by means of an electric furnace. This is known as the Johnson process, and is controlled by the Continuous Zinc Furnace Company, of Hartford, Conn. The Johnson process of treating zinc ores, invented by Woolsey McA. Johnson, formerly electro-metallurgist of the Orford Copper Company, and later metallurgist of the Lanyon Zinc, though designed primarily for the treatment of complex zinc-lead-sulphides, is also applicable to the working up of waste products of brass foundries and galvanizer's plants. The process is continuous in nature, and large units are possible. Briefly described, the process consists of heating the ore mixed with suitable fluxes to a full-red heat in a continuous type of "pre-heater" and so heated it is charged directly into an electric zinc furnace. The furnace is a two-phase furnace with several upper vertical electrodes and a return lower water-cooled electrode connected with the metal bath. The slag which floats on top, together with the charge, act as the resistance in which the heat is generated.

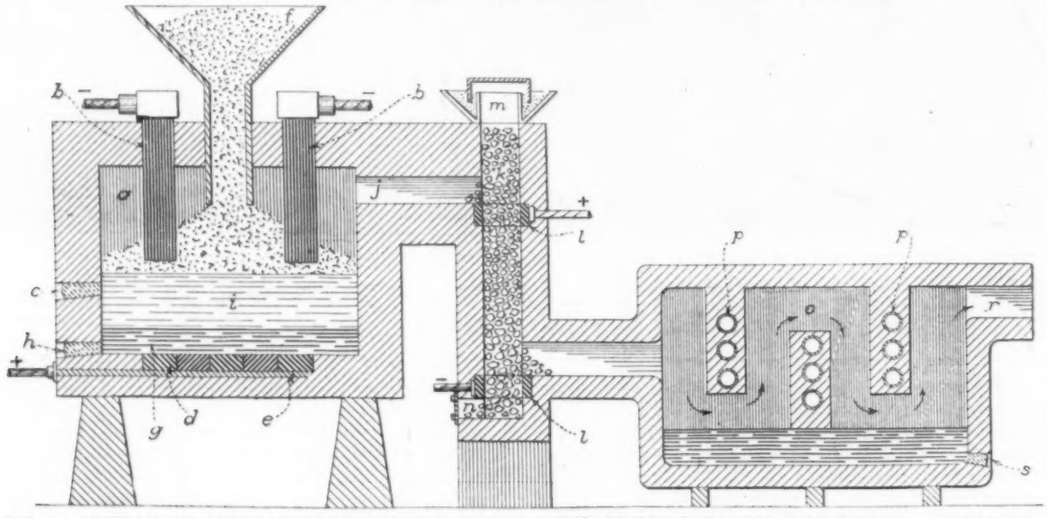


FIG. 1. SECTION OF JOHNSON CONTINUOUS ELECTRIC FURNACE FOR TREATING ZINC-BEARING COMPOUNDS.

In the smelting zone the final reduction of the metal oxides takes place. No air is admitted to the furnace, which is operated at a slight plus pressure. The zinc vapor arising from the furnace, together with such gases as carbon monoxide and carbon dioxide, passes through an electrically heated coke filter, and thereby the carbon dioxide is reduced to carbon monoxide. If such an operation were not performed the carbon dioxide would oxidize superficially the particles of zinc in the condenser

and prevent them coalescing. The net result would then be the formation of large amounts of blue-powder and little metal. The action of the Johnson filter prevents this.

The purified gases pass into a specially designed condenser, whereby the latent heat of vaporization is absorbed and a controlled percentage of "direct" spelter is made. This varies from 80 per cent. to 97 per cent., according to the rate of condenser. The rest is "zinc dust," and is caught in prolongs. The best reported record at the Hartford furnace is 290 lbs. spelter and 11 lbs. of "zinc dust." The condenser is tapped once or twice every twenty-four hours.

The mineral impurities of the charge are taken up by the slag which is tapped from the furnace at an upper taphole two or three times a day. The slag has a higher running temperature than a lead-furnace slag, but it is so superheated as to be thinly liquid. A typical slag analysis: SiO_2, 40 per cent.; CaO, 22 per cent.; NgO, 2 per cent.; FeO, 10 per cent.; MnO; $A1_2O_3$, 10 per cent.; ZnO, 2 per cent.; Cu, 0.15 per cent.; Pb, 0.05 per cent. When brass founder's skimmings are used a brass ingot 80 per cent.-90 per cent. Cu can be made, while the rest of the zinc is turned into merchantable spelter. The zinc dust is either resmelted or sold as such. Mr. Johnson has measured the temperature at which a 2-1 brass evolves zinc vapor freely at atmospheric pressure and has found it to be 1065 c. As the percentage of zinc decreases, this critical temperature increases, and while it is practically

trol over quality of products made firm, it is believed that it will be found better business to discard in many instances washing waste metal products and to put them through the electric smelting furnace directly. The Johnson furnace has, of course, a tremendous advantage over the old retort in smelting zinc ores, as it can be made of large capacity, while the retort has only a capacity of 50 lbs of ore. Furthermore, as it is desirable to eliminate the residues in the form of a slag, it can, of course, smelt ores that are impossible to treat in the old style fire-clay retort. The same advantages appear in treating waste products, but to a less marked degree.

The principal item in the cost of treatment is for power. At the Hartford plant power is purchased with a restriction against its use between the hours of 4 p. m. and 8 p. m. in the months of December, January and February, as this is the time of maximum demand, i. e., "Peak-load." Central stations can, where they are allowed to make a contract favorable to both parties by the public utilities commission, name for low rates per k. w. h. for a load of this class. The amount of power needed in a five-ton unit is from 400-900 k. w. h. per ton of charge. The current consumption is greater as the percentage of zinc in charge is greater on account of the amout of heat absorbed by the reduction and volatilization of the zinc.

The cost of a 5-ton furnace is not excessive, principally in the appurtenances, such as bus-bars, instruments, slag buggies, ladles, and molds. The furnace can be operated at a constant voltage from 45 to 75 volts, according to de-

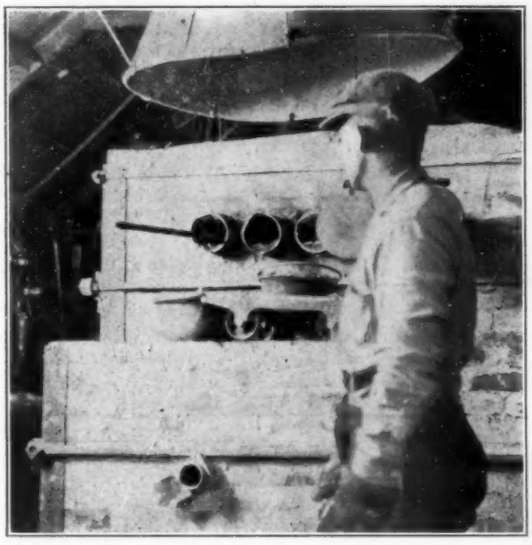


FIG. 2. TAPPING SPELTER.

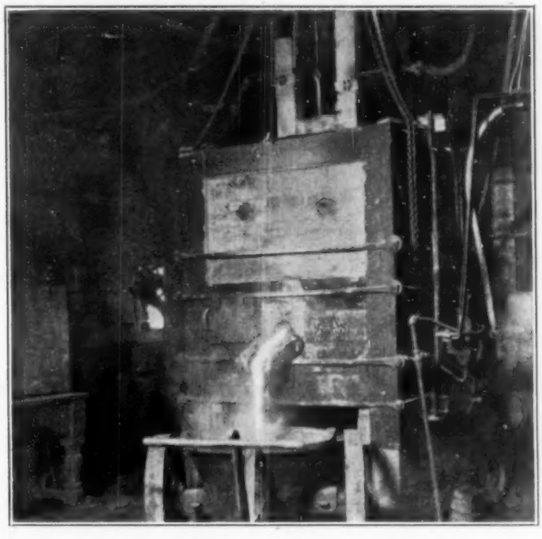


FIG. 3. TAPPING SLAG.

OPERATION OF THE JOHNSON CONTINUOUS ELECTRIC ZINC REFINING FURNACE.

(Photos Courtesy of Metallurgical and Chemical Engineering.)

possible to free the copper from zinc in the Johnson process, it is not commercially advisable to do it. The brass high in copper collects in the furnace beneath the slag, is tapped at intervals and cast into molds.

When galvanizer's skimmings are used they must be freed at first from sal-ammoniac and zinc chlorid by leaching with hot water. In this case the recovery of zinc is very high, from 97 per cent.-98 per cent. of the zinc charged into the furnace. As little slag is made in this case, it is only tapped when the accumulated amount of slag in the furnace is considerable. It is, of course, commercially feasible to smelt a variety of products, such as flue dust from a brass foundry, which contains considerable zinc oxide. As the cost of treatment is comparatively low and the recovery of values high, and the con-

sign. It is, of course, much easier of operation if a variable voltage transformer or otherwise style of electric furnace transformer is installed.

While the Johnson process has not the wide margin over present methods of handling scrap that it has over smelting zinc ores, especially the so-called refractory ores not now commercially available, yet the electrothermic effect of the electric current is such a powerful metallurgical instrument when its use is understood that there is no question but the process will find a use in the East as well as in the West. In the East it would find its most favorable location in some place where considerable waste metal products are made and where the freight rates to existing recovery plants are high, and where current or electric power can be purchased at such a rate that electric smelting can fairly and freely bear.

COPPER AND ITS ALLOYS IN EARLY TIMES*

By William Gowland, Assoc. R. S. M., F. R. S.

(Concluded from May.)

In the eleventh century great care was bestowed on the purification of the copper intended to be used in the manufacture of calamine brass for objects of art, more especially for the removal of lead, as it had been found that brass contaminated with that metal could not be satisfactorily gilt.

For an account of the process, which seems to have been conducted on but a small scale, we are indebted to a manuscript written by Rugerus Theophilus, a monk who lived in the early part of that century. The following is a translation by Hendrie:†

"Of the Purification of Copper.—Take an iron dish of the size you wish, and line it inside and out with clay, strongly beaten and mixed, and it is carefully dried. Then place it before a forge upon the coals, so that when the bellows act upon it the wind may issue partly within and partly above it, and not below it. And very small coals being placed around it, place the copper in it equally, and add over it a heap of coals. When, by blowing a long time, this has become melted, uncover it and cast immediately fine ashes of coals over it, and stir it with a thin and dry piece of wood, as if mixing it, and you will directly see the burnt lead adhere to these like a glue. Which being cast out, again superpose coals, and blowing for a long time, as at first, again uncover it, and then do as you did before. You do this until at length by cooking it you can withdraw the lead entirely. Then pour it into the mold which you have prepared for this, and you will thus prove it to be pure. Hold it with the pincers, glowing as it is, before it has become cold, and strike it with a large hammer strongly over the anvil, and if it be broken or split, you must liquefy it anew as before. If, however, it should remain sound, you will cool it in water, and you cook other (copper) in the same manner."

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	Copper, per cent.	Tin, per cent.	Zinc, per cent.	Lead, per cent.	Iron, per cent.	Nickel, per cent.	Antimony, per cent.	
1. Statue at Munich, 166 A. D.	76.90	0.64	19.69	2.68	0.17	0.10	...	Hampe.
2. Bas-relief, Germany, beginning of 17th century	65.34	5.04	25.64	2.09	1.79	0.10	...	Bibra.
3. Memorial brass, England,‡ 14th century	66.64	Trace	23.27	...	0.08	...	...	
4. Memorial brass, England, 1456 A. D.	67.54	1.16	24.16	7.14	...	...	...	Gowland.
5. Memorial brass, England, 1470 A. D.	66.81	2.56	28.50	2.13	...	...	...	
6. Memorial brass, England,‡ 1504 A. D.	64.00	3.00	29.5	3.50	...	...	...	
Angel's head, 17th century, Germany	59.35	1.30	37.63	Trace	1.13	0.39	0.20	Bibra.

From this, therefore, we may presume that as far as the copper was concerned the calamine brass of that period intended for art work would be a very pure alloy.

As regards the brass which was made in this country by the ancient method, *i. e.*, "calamine brass," and that made with spelter, the former, according to Dr. Percy, was preferred for the manufacture of buttons and articles to be gilt, as it was said to take the gold better in "water-gilding." It was also preferred for other purposes. It is difficult to see why there should be any difference between the two brasses unless the spelter of those days was more impure than at present, possibly containing more lead and iron. Prejudice against the metal made by a new process may, however, have been one of the causes of the opposition which was raised to its use.

It may be of interest if we now consider briefly the composition of calamine brass in this country and Europe up to the middle of the seventeenth century, as shown by the following examples which admit of a correct date being assigned to them:

Unfortunately, one example alone, No. 3 in the table, is free from an excess of impurities or intentional additions, and with this exception none throws any light on the causes of the superiority attributed to calamine brass as compared with that made by the direct union of the metals copper and zinc.

The alloy termed "latten," of which the memorial brasses Nos. 3, 4, 5 and 6 were cast, is as variable in composition as the ancient brasses, owing probably to the idiosyncrasies of separate founders as regards the mixture of metals best suited for this purpose, especially the proportions of tin and lead to be added.

With the disappearance of the calamine brass, one of the last links in the chain connecting the modern metallurgy of copper and its alloys with antiquity is broken. An important link, however, still remains in the *cire perdu* process of casting bronze, a process in which it can hardly be said that we are any further advanced than the Greek founders of some centuries before our era.

Further, it must not be overlooked that the principles on which copper refining is based were carried out in practice in the time of Pliny.

I hope that the outline of the history of copper and its alloys which I have endeavored to place before you—I fear imperfectly—may not be without value in these practical days.

The influence of copper, and particularly of bronze, from the Age of Bronze to that of Imperial Rome, is an element which has played a greater part in the civilization of Europe than that of any other metal. This is often lost sight of in this age of iron and steel. It hence seemed to me that it might be of interest and possibly of profit to present to the members of our Institute an account of the achievements which our fellow-workers in bygone ages were able to accomplish without the elaborate appliances and scientific knowledge of our own times.

APPENDIX.

Experimental smelting of mixed copper and tin ore in the primitive furnace (Fig. 1). The charge consisted of:

	Lbs.
Copper ore (copper carbonate) containing 30 per cent. copper	15
Tin ore (cassiterite) containing 20 per cent. tin	10
Limestone	7½
Charcoal	10

The charcoal and limestone were coarsely ground and mixed with the ores.

The furnace cavity was filled with charcoal, which was also piled above it to a height of about 2 or 3 inches.

*Presidential address, January meeting of Institute of Metals, London, England.

†An Essay upon Various Arts. In three books. By Theophilus. Translated by Robert Hendrie. John Murray, London, 1847. Page 313.

‡Haines' Manual of Monumental Brasses.

When the charcoal was well alight, a layer of the charge was spread over its surface, then another layer of charcoal, then alternate layers of the charge and of charcoal were added so as to form a conical heap. A gentle blast was then started through a 1-inch blast-pipe, and when the charge began to sink down into the furnace cavity it was slightly increased. When the whole of the charge and fuel had sunk down into the furnace the blast was stopped, the slag and remaining fuel removed, and the metal allowed to solidify. The metal was analyzed and found to contain 22.0 per cent. of tin.

(The End.)

TRISALYT, THE MODERN COMPOUND FOR ELECTRO-PLATING IN BRASS, COPPER, BRONZE, SILVER AND GOLD

By Charles H. Proctor.*

In recent years the development of the art of electroplating in the various metals has received a wonderful impetus. This has been largely due to the many novel mechanical features that have been introduced into the method, and the installation of practical measuring instruments that have enabled the plater to control to a large degree the color and thickness of deposit. During these years, and for a number of decades, no particular attention has been paid to the chemical part of electroplating, as far as the actual deposit of the metal is concerned. Of course, we realize that in the manufacture of cyanides on a more economic scale we have been enabled to purchase a purer article at less than one-fourth of the price of twenty years ago. The introduction of electric cleaners has simplified the method of cleansing and has brought forth considerable saving over the older method in many instances. But the greatest innovation, other than the mechanical features and electro-cleaners noted, has been the introduction of trisalytes or triple salts, the invention of Dr. Courant, the eminent electrochemist and metallurgist of Berlin, Germany.

Trisalytes are comparatively new on the American market, although in Germany and France they have been used with wonderful success for several years. But during the short space of time since their introduction here the results obtained have been so remarkable that an increasing demand is created for them every day. The progressive plater appreciates the fact that trisalytes gives the nearest approach to standardization of the various solutions that it is possible to obtain, and by the use of a material that is scientifically combined as one salt instead of several, enables him to determine to a greater degree than heretofore the cost of the material output of the plating department.

The advantage of the use of trisalytes can be readily inferred when we take into consideration the considerable difficulty in preparing brass baths of large proportions, say a thousand gallons or more. Platers who have prepared such baths know that it is impossible to determine at the outset whether they will obtain a satisfactory deposit without considerable labor afterwards or not. But with the use of trisalytes the preparing of baths of large proportions is simplicity itself. The requisite number of gallons of water and the necessary amount of copper and zinc trisalytes added thereto, and as soon as these additions have been made the solution is ready for use. There is no guess work, the results are certain. The water for solution can be used cold or only slightly warm. The same method of manipulation is carried out in the production of copper, bronze, silver and gold baths, and must surely appeal to the modern plater who understands fully the requirements of his art to produce the output of his department on the most economic scale.

It has been inferred that trisalytes are used only in connection with the preparation of new baths, but this is a mistake. One of the greatest results in the demands for trisalytes has been due to the beneficial and economic results in building up and replenishing baths, in present use, made up from the regular methods in vogue. A number of foremen of the largest plating departments in this country can testify that, by the use of trisalytes, they have been able to obtain better and more uniform results than was possible under the older method of replenishing the baths. In mechanical and barrel plating trisalytes have proved a wonderful success. Many platers have spent many weary hours in trying to overcome the difficulty in producing satisfactory deposits of brass and bronze, and even copper has caused considerable trouble. The reason for this can be readily explained to those who have always used still baths. The voltage required should be twice as great as for still baths; the concentration of the bath should be based upon the same lines and the internal resistance of the bath should be as low as possible. Under the older method this is somewhat difficult to obtain because the cathode surface of the material in a plating barrel is oftentimes so many times greater than the anode surface that the bath becomes readily impoverished in metal, due to this cause, and by constant additions of metal by the older method a disturbing influence is developed in the baths that give considerable trouble. Trisalytes overcome such troubles because the degree of concentration can readily be maintained without disturbing influences due to the solubility of the material which can be added while the baths are in motion, if the emergency arises. To those who have not tried the material, I would suggest that you make a comparative test with these salts over the older method that you have used for years. In this manner you can prove to yourself whether the economic and other advantages claimed for trisalytes are worthy of your consideration.

*With Roessler & Hasslacher Chemical Company, New York.

NEW GERMAN ALUMINUM GALVANIZING PROCESS.

In a new process for galvanizing aluminum patented in Germany, the previously cleansed aluminum is scoured in the ordinary manner and then dipped into a heated acid solution and simultaneously subjected to the action of reducing agents, such as alcohol, which prevent a too rapid reaction. After being in this solution for a brief time the aluminum is transferred to an ordinary galvanizing bath. According to experiments, galvanizing thus executed is both durable and can be given a remarkable polish. As we know, application by electrolysis of a coat of metal on aluminum has hitherto been difficult, and now the "Langbein-Pfanhauser Werke," of Leipzig-Lellerhausen, claims to have invented a process, after much study and experimenting, which gives the required result. In this process the metallic coat deposited on aluminum plates is absolutely adhesive. Articles made of galvanized aluminum were bent in all directions, heated to a high temperature in a flame, and suddenly chilled in cold water, without the coating being broken. More than this, these same objects were bent to breaking point without the deposit of metal being detached. Aluminum can thus be plated with gold, silver, brass, copper or nickel.

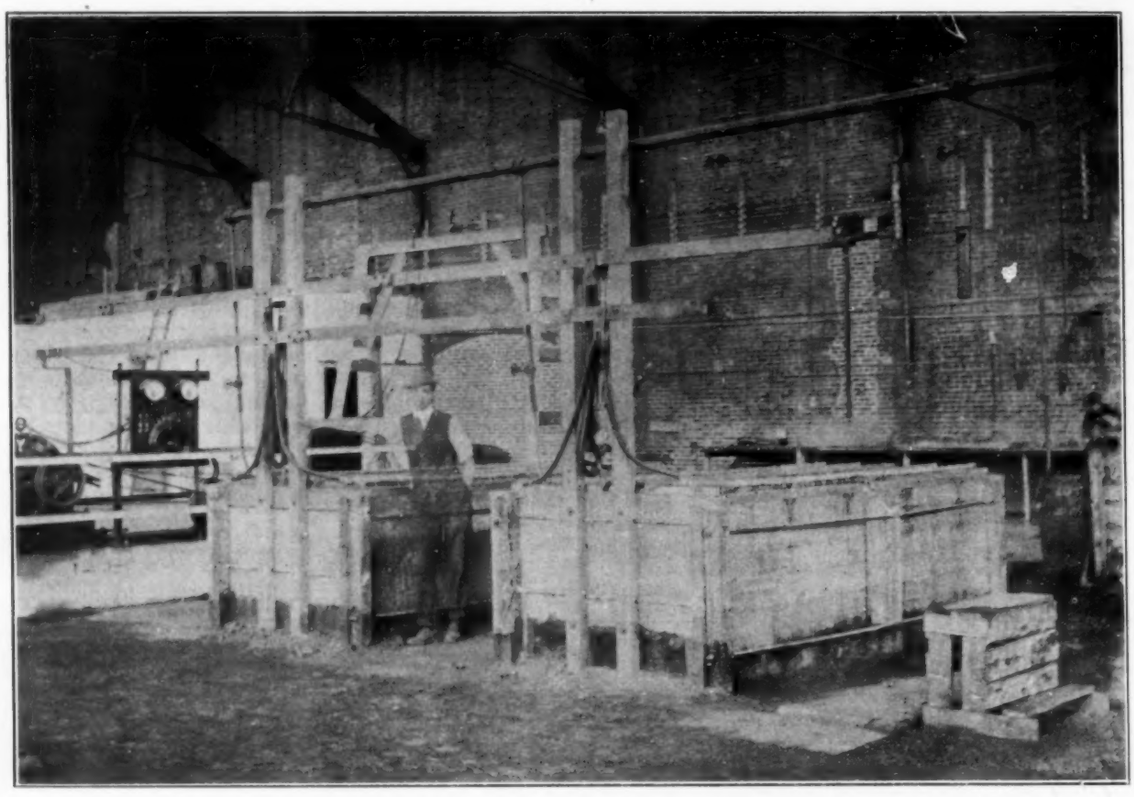
METALLIZING OF NON-METALLIC OBJECTS

A DESCRIPTION OF THE PLANT OF THE NATIONAL METALLIZING COMPANY AT GARWOOD, N. J.

The electro-deposition of a metal coat upon articles composed of non-conducting materials has been in actual practice for some years. The principles underlying the process are simple. All that is necessary for successful deposition is to render the surface of the non-metallic article so that it will conduct a current of electricity. Perhaps the best-known concerns in this country that are engaged in this class of work are the Benedict Manufacturing Company at East Syracuse, N. Y., and the Delamothe Studios in Oakland, Cal. A complete description of the Delamothe process was published in THE METAL INDUSTRY, June, 1909, while numerous formulas for the preparaton of work for metallizing have been published from time to time. The products, however, of the above-mentioned concern are mostly metallized flowers and perishable objects of like nature, used for hatpins and articles of personal adornment, while in contra-distinction to them is a company recently organized to carry on a metallizing business at Garwood, N. J.

This company, known as the National Metallizing Company, is made up as follows: F. S. Viele, 49 Wall street, New York City, president and treasurer; Edward Wanton Robinson, New York City, vice-president and general manager; Sigmund Lorentz, Brooklyn, N. Y., superintendent. Mr. Lorentz has been experimenting in the metallizing business for the last twenty years, and probably understands it as thoroughly as any one in this country today. J. Burt Gildersleeve & Co. are the selling agents of the company, with offices located at 1482 Broadway, New York City, where the selling end of the business is handled. There will be found in these offices inclusive samples of the work which will show clearly its merits, both from the artistic and selling points of view. The directors of the company are F. S. Viele, 49 Wall street, New York City; M. A. Viele, of the firm of Viele, Blackwell & Buck, 49 Wall street, New York City; Fred P. Warfield, of the firm of Duell, Warfield & Duell, 2 Rector street, New York City; Francis G. Plant, art director of the Hartford Faience Co., Hartford, Conn.; J. Burt Gildersleeve, of the firm of J. Burt Gildersleeve & Co., 1482 Broadway, New York City; Royal P. France, 2 Rector street, and E. W. Robinson, New York City.

The National Metallizing Company have at Garwood, N. J., a modern, finely equipped and up-to-date factory, where they turn out their products under the name of "armor bronze." The factory itself, of which we show two interior views in the accompanying cuts, is extremely well lighted, and there is ample space for carrying on the various parts of the process. The plating or deposition tanks are situated in the middle of the building and at either end are located the various rooms in which the details of the work are carried out. Beginning at the extreme right-hand corner is the molding room where the plaster and terra cotta objects for the metallizing are made. Going from this room to another, slightly smaller, the objects are prepared for the metallizing bath. After they have been given the requisite coat of metal in the plating bath they are taken to the other end of the plant where, after being dried in the proper manner, they are given the various finishes that are called for by the particular purpose for which they are designed.



THE PLATING TANKS AT THE GARWOOD, N. J., PLANT OF THE NATIONAL METALLIZING COMPANY.

Armor bronze is defined by the company as a seamless coating of pure copper electrically applied to any non-conductive material, such as plaster, wood, terra-cotta, faience, concrete, etc., then finished in any metal finish, such as Roman or antique gold, verde antique, statuary bronze, silver, brass, glisten bronze or copper. This product is applied to gas and electric fixtures, signs, trade marks, advertising novelties, clock frames, statuettes, architectural pieces, such as capitals, brackets, friezes or to pieces in terra-cotta and faience. It is claimed that armor bronze produces the exact appearance and wearing qualities of solid metal, with a fraction of the weight and cost.

The chief advantage in this process over casting is that the under-cuts can be preserved and accentuated. The metal can be applied very easily to the most intricate designs, whereas in casting there are many places where it is impossible to get the sharp lines and deep under-cutting necessary to give the metal its full strength and beauty.

There is hardly a sphere in the commercial world where metallizing cannot be used, but the lines which this company intends to manufacture at present cover all kinds of gas and electric fixtures, garden furniture, in both terra-cotta and concrete, lamp shades and lighting decorations, interior ornamental plaster, faience work, signs, trade marks and advertising novelties, and almost every phase of art goods, such as statuary, busts, bas-reliefs, etc. Where the design is intricate the cost is much less than the cast metal, and the fact that this material weighs only about 25 per cent. of cast metal, makes it very superior for chandeliers and hanging fixtures. The industry is only in its infancy in this country, but its possibilities are tremendous, and when one realizes that it can be used equally as well on hard substances, such as terra-cotta and concrete, as on pliable substances, such as cloth, lace and the most delicate fabrics, it is easy to see that its growth and usefulness, as it becomes better known and appreciated, will be very great.

A CORNER OF THE MODELLING ROOM OF THE NATIONAL METALLIZING COMPANY. THESE ARE THE OBJECTS THAT ARE METALLIZED.

COPPER IMPORTS AND EXPORTS OF THE UNITED STATES FOR 1912.

Copper and copper manufactures imported into and exported from the United States in the fiscal year 1912 will approximate 150 million dollars in value, or more than ten times the total of 1892 and almost two and one-half times that of 1902. Figures compiled by the Bureau of Statistics, Department of Commerce and Labor, show that during the nine months, ending with March, imports of copper, including both ore and manufactures, aggregated 31½ million dollars, and exports 86 million, the total movement into and out of the country thus being 117½ million dollars and indicating that the approximate total for the fiscal year will be 150 million dollars, of which about 110 million will be on the export side.

This total of 117½ million dollars' worth of copper and manufactures thereof passing into and out of the country during the nine months ending with March represents a large gain over preceding years. Nine months' imports of copper in its various forms increased from less than 20 million dollars in 1902 to 30 million in 1911 and 31½ million in 1912; while exports increased from 30¾ million dollars in nine months of 1902 to 77½ million in the corresponding period of 1911 and 86 million in a like period of the current year.

THE INFLUENCE OF STYLE ON THE ART METAL WORK OF MODERN TIMES

By A. F. Saunders.*

(Third paper, continued from April.)

The first manifestation of Christianity in the arts, the Byzantine style is essentially liturgic and symbolical. The forms, even the substances, are the fixed signs, literally speaking, or immutable expression of ideas and dogmas, as formerly in ancient Egypt. Byzantium, or what is now called Constantinople, succeeded decadent Rome. The height of Byzantine art was reached during the fifth century of the Christian era. It seems to have mingled in its style the spirit of Asia with that of Europe, or the Eastern and the classic schools, resulting in a hybrid but splendid style of ornament, and its influence was strongly felt all through the decorative art of Europe. Practically contemporaneous with the Byzantine we find the Romanesque, the difference being in a difference of expression only, that of the Byzantines of the East, that of the Romanesque of the West. The characteristics of these decorative styles are most suggestive of barbaric splendor united with a most effective disposition of plain surfaces. While a certain amount of stiffness and crudeness is noticeable in the outlines of the numerous geometrical patterns, yet one can but be impressed with the wonderful amount of richness and strength of ornament. As in Grecian and Roman decorative art the Acanthus plant forms its chief motif. This also descended to the Romanesque school, and while a little differently treated, is enough alike to at times make it very difficult to distinguish properly the Byzantine from the Romanesque, so closely are they allied.

Above all, Byzantine art of the best period teaches the value of contrast between plain and enriched surfaces, the strength of ornament applied to an already constructed or formed material in distinction to that which is part of the construction of itself; also the value of ornamental construction in place of constructed ornamentation. When we consider the great similarity and close relationship between the Byzantine and Romanesque schools, it is but proper to classify and describe them together. As before stated, the former came under Eastern influence, the latter under Western, this difference must be kept ever in mind to be properly understood, and a careful study of illustration No. 6 will perhaps give one a comprehensive idea of this difference. Pure Byzantine art declined greatly after the invasion of the Turks, who introduced a wholly Oriental spirit into the country. The political influence which the Byzantine Empire enjoyed during the period of its supremacy, however, had one important effect—it created the new Christian art which had already begun to develop in the West under the Romanesque, and from this further developed the Gothic style, which predominated all through the middle ages. This style will form the nucleus of my next article; therefore, we will now go back and take up the Islam series of ornament.

Islam art sprang into existence and followed the wonderful conquests of the Moors, and quickly advanced to a high state of development. However, one must not conclude from that fact that a specific Islam style was formed; it was more the utilization and combination of the art materials, and whatever else already existed in the conquered countries. All kinds of influences are evident; for example, Byzantine, Romanesque, Phœnician, Assyrrian, Persian and even Indian and Egyptian influence is plainly traced all through its composition. As the representation of man or animal was strictly forbidden by the Mohammedan religion, Islam art was confined to geometric forms and plant life. Although this peculiarity applied more to the later periods, as very early examples have been found containing animal forms, neither did it apply to the Indian or the Persian Islamite decorative art. Properly speaking, Islam art is divided into five divisions, including the Indian style, Moorish, Arabian, Saracenic, and Ottoman. Of these, perhaps the Moorish is the best development; certainly the wonderful buildings of the Moorish kings in Spain during the XIIIth and XIVth centuries, such as the Alhambra, the Alkazar, and the beautiful Cathedral of Cordova, places this style at the very zenith of the Islam series.

Despite the exuberance of the ornamentation and the rich and vivid coloring of the decorative painting, Moorish ornament never wearies or confuses the eye. The

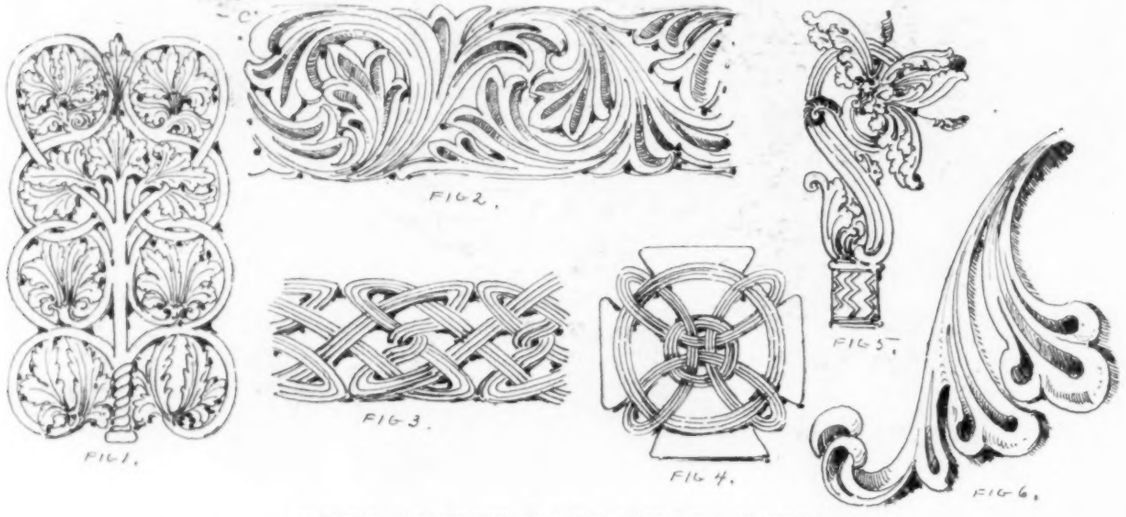


PLATE 6. BYZANTINE AND ROMANESQUE ORNAMENT.

Byzantine.

Fig. 1. Decorative wall panel from the atrium of St. Mark, Venice.
Fig. 2. Stone carving, St. Sergius, Byzantium (Constantinople).
Fig. 3. Byzantine freze example of interlacing.

Romanesque.

Fig. 4. Norman Romanesque stone carving.
Fig. 5. Romanesque crozier in cathedral at Sens.
Fig. 6. Romanesque treatment of acanthus leaf.

*Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

technical drawing and coloring of each individual system of ornament is so clearly defined and so plain that each can be easily distinguished from the other. Most characteristic of all Islam ornamentation is the intricate interweaving of geometric and Arabesque design, the decorative artists showing most wonderful powers of fancy and imagination. Of Arabian and Saracenic ornament little is known; however, when Sicily was conquered by the Normans, the Saracens placed their art at the disposal of the conquerors. Thus a peculiar Saracen-Norman style developed itself in Italy, which undoubtedly had some influence upon the later development of the Renaissance. After the subjugation of Constantinople, 1453 A. D., Ottoman art developed independently, rising to its highest splendor, naturally influenced more or less by both Byzantine and Persian ornamentation, its independent character was lost during the decline of the political supremacy of the empire. Aping western Europe art, it finally became a conglomeration of all possible styles.

I conclude this series with the Indian ornament after its coming under the influence of Islamism, which made its appearance in India about the XIIth century. It found already there an ancient style of art, most barbaric in gorgeousness, combining these ancient Indian elements with those of Arabian art and ignoring the command laid down by the Khoran that living animals should not be represented artistically, it developed a peculiar splendor and character all its own. By carefully comparing the several illustrations shown in plate No. 7, some idea can be had of the characteristic elements forming the various styles of the Islam series.

(To be Continued.)

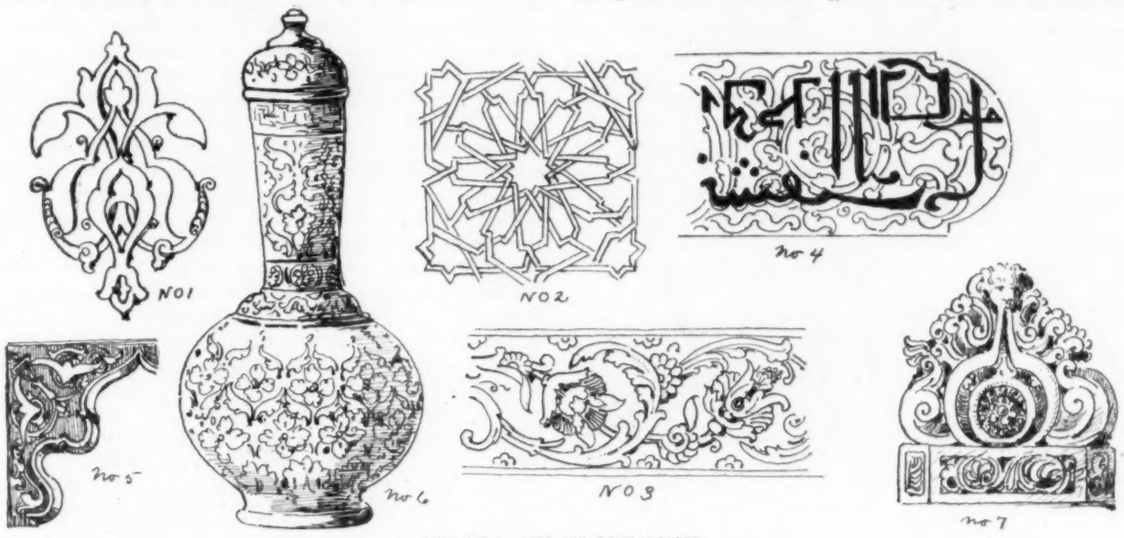


PLATE 7. ISLAM ORNAMENT.

Fig. 1. Tile ornament (Ottoman).
Fig. 2. Moorish geometric ornament.
Fig. 3. Arabian decorative border.
Fig. 4. Concave molding, glazed tile (Ottoman).
Fig. 5. Fragment of wall decoration, Djami Mosque in Brusa (Ottoman).
Fig. 6. Incrusted silver vase (Saracenic).
Fig. 7. Crest of pilaster (Indian-Islamite ornament).

FINISHING METAL GOODS BY MEANS OF STEEL BALLS

A Description of Methods and Apparatus Used in the Process of Burnishing.

By Albert Pott.*

Of the many ways of finishing metal goods, perhaps none is being given more careful study at this time than the method of burnishing by means of steel balls. This process, while now generally used in this country, by no means originated here, as it is known to have been in use for some years to a greater or less extent in several European countries. The old saying, "Necessity is the mother of invention," might as well be read with the word competition, substituted for necessity, for competition in the line of small hardware, garment trimmings, etc., has probably done more towards the development of the ball burnishing process than anything else. As is generally known, the handling of one piece at a time to burnish by the old method was slow and expensive, hence a cheaper method was sought and found in ball burnishing. This process consists in rolling or tumbling the articles together with steel balls and solution in a barrel. Any kind of a barrel, however, will not do, the horizontal type having been found by experience to be the best, tending to keep the work and balls well mixed, which the oblique type of barrel does not do.

These barrels are lined with wood, as cast iron on some classes of work seems to work into the metal and later results in discoloration and again tends to dull rather than brighten the work. Barrels of brass, of course, would be expensive. The balls should be hard and smooth, but not necessarily round. Concerns making balls for ball bearings sell their imperfect balls for this purpose, while, of course, other concerns are now springing up who are making them for this particular purpose. As a hand burnisher would not use a tool softer than the article to be burnished, the reason for thoroughly hard balls is apparent, and, of course, they must be smooth, or they would be apt to scratch the work. The quantity of balls in proportion to the work varies, but most concerns seem to have the fault of not getting balls enough. Generally about one-half to two-thirds of the load in the barrel should be balls, but some cases will need more, whereas others might show good results with less. It has been found that articles in the nature of shells require quite a greater quantity of balls than those articles comparatively small, more solid, and of a rounding nature. The work should be kept well separated by the balls or to emphasize the process, the articles should be kept well surrounded by balls. While, of course, a certain amount

*With Baird Machine Company, Bridgeport, Conn.

of weight or pressure is absolutely necessary, there is a limit as to what can be used. As it is "the constant dropping of the water that wears away the stone," so the constant rubbing of the little burnishing tools under a right amount of pressure produces the results. As one stroke of a hand burnishing tool under very heavy pressure would not give results, neither will excessive pressure in the ball barrel.

The length of time required generally varies from about one hour to a day or two, depending entirely on conditions, such as, the condition of the article when put in the barrel, the quality of finish desired, etc. The smoother the article when put in the barrel the less the time required. Articles of a rounding nature naturally finish quicker than articles of a flat nature. The size of the balls in common use are from about ¼ in. to 1/16 in. in diameter, and are often used mixed. The smallness of the ball, of course, is governed by the figure or indention, corners, etc., in the work, which, of course, would not be burnished if the balls were not small enough to get into them. Generally, however, in any case, the smaller balls give quicker results, but the small balls cost more than the large. It can easily be seen that four 1/16-in. balls would make four rubs where a ¼-in. ball would only make one. For buffing or coloring articles after plating, only about 15 to 30 minutes is required, as too long rolling rolls off the plate. It might be truthfully said that the ball buffing process tends for better plating, as poor plating very soon shows up in the ball barrel. In regard to solutions, while different men, of course, learn little kinks by experience, and naturally do not publish them broadcast, the most common is a good non-alkali soap solution. Some add a little cream of tartar to help bring up color or help to prevent rust, or, with steel articles, a little cyanide. Some concerns on steel use liquid potash and cyanide solution. Soap solution is almost invariably used for buffing after plating. Soft water, of course, is better than hard.

One of the main essentials to success by this process is cleanliness. Barrels must be kept absolutely clean and free from grease or dirt, and it is a good thing to wash out occasionally with hot potash water and hot soap water. Also remember that the balls do not remove the metal, but simply burnish or brighten—not smooth—whatever surface is presented to them. Do not put an article made of hot rolled stock without first grinding it down or smoothing it, or a casting with sand on it, into a ball burnishing machine and expect to get as good results as you would if you used cold rolled stock or ground castings. While the methods connected with ball burnishing are not difficult, as in all other comparatively simple things, care and attention must be given, as well as study, to observe results under slightly varying conditions in order to get the best out of this method. But in comparison to the great results obtained by comparatively little expense and from careful study, ball burnishing is well worth the care and attention of any manufacturing plant wherein the process could be used, and it is yet in its infancy. The cost of the barrels vary, according to size, from about $80 up. Balls vary, according to size and quality, but are about 20 to 30 cents per lb. A peck weighs about 100 lbs. Soap chips or burnishing compounds, cost about 9 cents per lb., by the barrel, so that the whole process is inexpensive.

THE ASSAY OF NICKEL PLATING SOLUTIONS

By G. Bernard Brook.*

(Concluded from May.)

GRAVIMETRIC METHOD.

Several gravimetric methods exist for the determination of nickel. One of the most recent methods, applicable alike to plating solutions and alloys containing nickel is comparatively easy to carry out. The nickel is precipitated (thrown out of solution in an absolute form) as a scarlet compound called nickel oxime. The reagent used is dimethylglyoxime dissolved in alcohol. The process is carried out as follows: Take 100 cc. of the nickel plating solution to be assayed, dilute to a litre and mix thoroughly. Take 50 c.c. of this *dilute* nickel solution, add 2 grms. citric acid, 200 c.c. boiling water, 10 drops hydrochloric acid, and 50 c.c. dimethylglyoxime reagent (prepared as below):

Heat just to boiling and add 10 c.c. strong ammonia. Allow precipitate to settle on warm plate (do not *boil*) for twenty minutes. Filter either (a) through Gooch crucible, previously weighed, or (b) through plain smooth filter paper cone; wash precipitate with hot water, open out the paper cone on an inclined tile and wash the precipitate into a weighed 3-in. porcelain dish, using as little water as possible. Evaporate the water off at 100 degs. C. Whether method (a) or (b) is adopted, the precipitate requires finally drying in an air oven at about 160 degs. C. for an hour, at the end of which time it should be cooled and weighed. Increase of weight multiplied by .2032 = the weight of nickel in 5 c.c. of the original plating solution. The weight of the *oxime* multiplied by 652 gives the ounces of nickel per 100 gallons, when the above quantities are used.

Special Reagent Required. Dimethylglyoxime and its solvent are both expensive substances. Each determination costs approximately three pence for the special reagent. It is prepared by heating 500 c.c. of rectified spirit nearly to boiling and adding 5 grams dimethylglyoxime; when dissolved, cool and transfer to stoppered bottle. Each 50 c.c. of the reagent will completely precipitate 0.1 gram of metallic nickel (the amount in 5 c.c. of ordinary plating solutions does not generally exceed this amount). For safety a few drops of the reagent should be added to the filtrate from the scarlet oxime to make quite certain that all the nickel has been precipitated.

COMPARATIVE VALUE OF THE THREE METHODS.

Under this head we must consider the relative advantages of the three processes as to (1) Accuracy, (2) Speed, (3) Cost, both the initial outlay and the upkeep, and (4) the Applicability of the aparatus to uses other than the assay of nickel. (1) Accuracy: All three processes give accurate results with ordinary care. Greater accuracy would be secured by the trained man, but the object of the author has been to give comparatively easy, straightforward methods for the *commercial* assay of nickel solutions.

The following results, obtained with the three processes confirm this claim:

Method.	Vat. B. B.	Vat H. P.	Vat. S.	
Cyanometric	284	278	238	ounces
Electrolytic	280	273	235 236	Nickel per 100
Nickel Oxime.....	...	...	237	gallons

2. Speed: The Cyanometric method is by far the

*Lecturer in Prep. Non-Ferrous Metallurgy, the Department of Applied Science, Sheffield University.

quickest, an assay being easily completed in half an hour. The electrolytic method takes about three, and the determination as oxime about four hours. Of course, in the two latter methods, during the deposition of the metal in the first and the drying of the precipitate in the second, no attention is needed. This possesses an advantage in that assays can be carried on whilst the ordinary work is in progress, an occasional glance sufficing to see that things are right.

The striking similarity that the electrolytic determination bears to the man's daily work ensures an interest that the other two methods do not possess. A further strong point in its favor is the confidence given by actually seeing and weighing the metallic nickel as such, as compared with—at any rate to the untrained man—the faith required to believe that the scarlet compound does actually contain the metal.

3. Cost: The cyanometric method demands but a very modest initial expenditure, and the cost for materials per assay would be about fourpence. The electrolytic and gravimetric methods demand a chemical balance, which considerably increases the initial outlay but widens the scope of the worker. The cost of apparatus for the cyanometric assay will meet the pocket of the smaller manufacturer or shops entirely devoted to the deposition of nickel.

4. THE APPLICABILITY OF THE APARATUS TO USES OTHER THAN THE ASSAY OF NICKEL.

With the apparatus specified for the cyanometric method, very little extended use can be made, except, perhaps, the determination of "free cyanide" in silver plating baths. If, however, a balance be added, many assays, such as that of potassium cyanide, are possible.

In large establishments where copper, brass, tin, as well as silver and nickel are deposited, much profitable work might be done by a technically trained man, not only in assaying the plating solutions, but in testing materials purchased, such as cyanide, nickel and other metallic salts, alkalis for cleansing—to name only a few.

By combining the three processes, the plater has at hand means not only for controlling his own department with greater economy and certainty of results, but could with a little practice undertake the approximate analysis of brass, hard solders and silver solder, etc., used in the other departments. The methods for the latter, as also the electrolytic determination of copper and silver in plating solutions, does not come within the scope of this paper, yet they should be kept in view as possible lines of development.

CONCLUSION.

The reliance to be placed upon the Spec. Grav. or Twaddell readings of nickel solutions has already been touched upon. Later experiments confirm the utter worthlessness of these density indications. Nickel, so far as the gravity indication proves, could be absent entirely from the solution, and the ammonium sulphate present would account for 7 degs. or 8 degs. Twaddell. A 10 per cent. solution of ammonium sulphate registers 11 degs T., and the addition of a few ounces of nickel sulphate per gallon would give a reading of 12 degs. This reading would satisfy the average man that the vat was strong enough. The possibility of variations in the relative proportions of nickel sulphate to ammonium sulphate in "double salts" ($NiSO_4$ $(NH_4)_2$ SO_4 $6H_2O$) led the author to determine the composition of nickel solutions that had been use for some years, with the following interesting results:

	"B. B."	"A. P."	
Age	16 yrs.	6 yrs.	
Sp. Grav.	1063	1057	
= °Twaddell	12.6°	11.4°	
Nickel (oz. per 100 gal.)	284	278	
Ammonia (gms. per 100 c.c.)	0.496	0.474	
*= Double nickel salts	9.22	8.80	oz. per gal.
*= Single nickel salts	6.93	6.54	oz. per gal.

Interpretation of these results showed that the solid residue from these two plating solutions would consist of

	B. B.	A. P.
Double nickel salts	51	57 per cent.
Single nickel salts	49	43 " "

* = signifies "equivalent to."

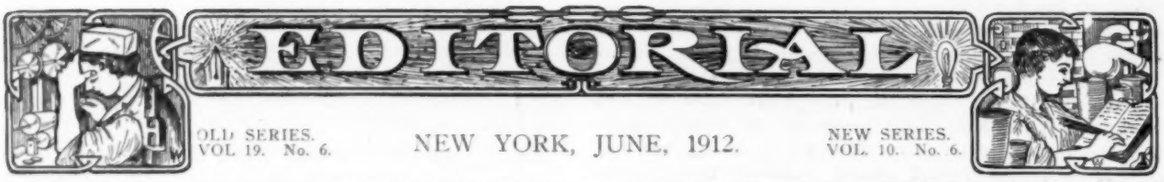
If the gravity indications can be relied on, then since 11.4 degs. T. indicates 278 oz. per gallon nickel, 12.6 degs. T. should indicate 307 oz., but analysis only shows the presence of 284. The gravity therefore shows nothing in solutions containing both double and single salts. If any further proof for discarding the gravity test is needed, the fact that a saturated solution of double salts (20 degs. C.), with a nickel content of only 173 oz. per 100 gallons, gives a Twaddell reading of 8.6 degs., should convince the adherents of the old fashioned method of its uselessness, in the light of the history of sample "A. P.," which follows.

The results of the analysis of the solution "A. P." opened out a matter of considerable interest. The plating solution had been prepared, controlled, and continuously worked for six years by the same plater. He states that it was made entirely from the double sulphate, and its strength has been maintained throughout by additions of the same salt, and no "single salts" have ever been added. Analysis shows that at the present time the solution contains 8.8 oz. of "double" and 6.5 oz. of single nickel salts per gallon. Thinking that this result might help in the solution of the vexed question of the merit of "double" versus "single" salts for nickel plating, an experimental run was made for 36 hours with a saturated solution of "double" salts, using a fairly heavy current, with a view to seeing if the ammonio-nickel relation altered—whether, in other words, the ammonium sulphate was electrolyzed (with the loss of NH3) more rapidly than the nickel sulphate.

The result was negative, the percentage of ammonia before and after the experiment being 0.615 and 0.609 respectively, although the nickel content had decreased about 7 per cent. While it is hardly possible to compare a result of 36 hours' duration and two gallons bulk with that existing in a vat of several hundred gallons in constant use for six years, yet one would have expected some slight evidence of such change. Of course, the E. M. F. would be a large factor in such electrolysis. If, however, "double sulphate" does break down, as is shown by the analysis of "A. P." (and I have every confidence in the gentleman who supplied me with the solution and its history), the use of a bath originally made up from *both* salts, and replenished with the "double" salt only, would appear to promise the best results.

USE OF SCRAP.

It is to the advantage of the brass founder as regards economy to use as much scrap as possible and the quantity thus employed varies from one-third to two-thirds of the weight of the charge. Of course, in using old metal many more impurities are liable to be introduced than with new metal. The presence of noticeable quantities of foreign matter is generally exhibited by increased hardness and the fracture.



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THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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WEALTH FROM SCRAP

The much despised "scrap heap" in large industrial establishments has on many occasions been turned to advantage, and we have a clear recollection of a prominent electrical firm being some thousands of pounds to the good at the end of a certain year through attention to this matter. Like many other firms, they had been rather negligent in the use of their scrap cables. Some five or six years ago when the price of copper rose to a very high figure the manager of one of the departments in the establishment turned his attention to the scrap heap. Scrap cable was stripped and several tons of copper recovered which was used to good effect in the manufacture of new cable. This salutary lesson has not been lost sight of, and we could cite a good many cases where the pinch of circumstances has revealed to manufacturers the possibility of finding wealth in the scrap heap.

The amount of scrap in all large establishments is of considerable quantity and importance per annum, and the economical working up of this material presents a problem to those responsible for the brass foundry costs and working in such establishments which is of considerable interest. In certain departments of locomotive engineering and carriage works the quantity of scrap non-ferrous metals is so great that it might be as well to consider how the disposal of this may be economically effected. In the light of the above the practice of a large English concern in the handling of their scrap will be interesting. In the workshops of the Lancashire & Yorkshire Railway Company "rolling scrap" is readily accounted for by separating all articles whose composition is known and using them over again as an addition to the new mixture. Slide valves, for instance, are branded by distinguishing marks cast on, and are used again together with the shop gits in proportion of half old valves and half other constituent metals, these latter not usually new ingots. Scrap of unknown value from outside as well as borings and turnings from the machine shops, cannot be dealt with so directly. Brass borings received from the machine shop are generally contaminated with iron and steel turnings and sweepings, and also may be mixed with white metal from the boring machines. In order to separate these ingredients, borings containing white metal alloy are heated on a sloping hot plate over a coke fire, so inclined that as the white metal softens and melts, it gradually runs off into a receptacle, leaving the brass to be scraped over the top of the plate. The whole of the brass borings received for melting-up are passed over a magnetizing machine to extract the iron particles which are collected and taken away.

This makes for cleaner castings and more homogeneous material. It is then customary to work this up by

melting in an air furnace of 25 cwts. capacity, fired by producer-gas. A definite composition is arrived at, and subsequently cast into iron-chill molds in the form of ingots. Such ingots, after their composition is ascertained by analyses, can then be profitably used in many directions, by forming the basis of fresh charges, along with other small amounts of new metal, to give the desired result. With the scrap is charged 400 lbs. of scrap copper shearings obtained from old firebox plates in the boiler shop, and 30 lbs. of block tin, the whole charge amounting to 20 cwts. This is melted in two or three hours, and covered with a small quantity of sawdust to reduce oxidation. Samples are withdrawn and their fracture noted, and slight additions of tin or other metal made to bring them to one standard fracture; then the charge is tapped out into a 5 cwt. ladle and run into ingots. This metal is also used for the smaller brass axle-boxes, radial and tender brasses, and for this purpose is poured direct into green sand-molds, and also cast into ingots to form the bulk of many mixtures. The metal for the ordinary run of castings is melted in a modern type of tilting crucible furnace of 400 lbs. capacity, fired by coke and worked by air-blast from a small motor-blower attached to the furnace.

The crucible is permanently fixed in the furnace, thereby reducing the risk of cracking, due to cooling and handling, and careful records of 45 crucibles show an average life of 39.6 heats before renewal. This method is found to be a distinct improvement over the usual 120 lbs. crucible heated in a coke "pot" fire and withdrawn for casting purposes, both in life of crucible and amount of coke used per cwt. of melted metal. All fettler's dust, molder's spent sand, furnace ashes and slag are systematically collected and riddled through a half-inch riddle to collect coke and clean shot-metal, which is separated. Shot-metal and slag or clinker are sent to the pug mill and crushed wet, the recovered shot-metal being stored separately for disposal, while the powdered slag, etc., settles and is collected in a water tank for subsequent sale. The spent sand containing metal particles is also passed through a riddle to collect the larger shot and afterwards in warm water in a sieve, thereby collecting every particle of metal, while the sand and any oxide dust is likewise washed off and collected for disposal, thus no particle of sand, scale or dust is thrown away by this procedure. Slide valves have been made to the following composition: Copper, 84.5 per cent.; tin, 10 per cent.; lead, 5 per cent., and phosphorus, 0.5 per cent. (added as 15 per cent. phosphor copper).

Tensile tests taken normally and at temperatures up to 400 degs. Fahr. did not indicate any particular loss in the strength of this alloy at these temperatures, as compared with the cold state. Other mixtures containing as much as 13 per cent. lead have been used with fair results, while gun-metal valves of an alloy of 86 per cent. copper, 12 per cent. tin, 2 per cent. zinc, and therefore containing no lead, have not justified expectations under comparative tests in service. The mixture used is made from half old worn-down valves and half new metal, the copper being obtained from clean scrap-plate shearings cut from old firebox plates. These plates are bought to specification containing arsenic, 0.35 to 0.5 per cent., with other elements (exclusive of combined oxygen), not over 0.25 per cent. This mixture was adopted after trials to find the best wearing properties both of the valve and the cast iron cylinder port faces. Such valves of varying designs, from the simple "D" valves to the balanced types, have given satisfaction, working under temperatures of from 450 degs. Fahr. to 600 degs. Fahr., in the steam chests. They do not fracture in service, and an unbalanced "D" slide valve ⅞ inch thick will run 1,000 miles with a wear of 0.035 inch on the face. The wear of the balanced valves is not so much as this, careful measurements showing (in the case of valves working in a vertical position, known as back-to-back balanced valves), a wear of 0.0055 inch per 1,000 miles run. These valves are allowed to wear down ⅝ inch for both valves, the total mileage being 114,266.

Modern conditions of superheat have caused the question of valves to come again under revision. There has been running for two years at Horwich a pair of ordinary slide valves at a temperature of 600 degs. Fahr., with only a wear of 0.013 inch per 1,000 miles. Further, twenty engines have just been turned into traffic with a modified form of slide valve for superheat. In the strict sense of the term these are slide valves, and, so far, have given good results. Slide valves are molded in sand from plate patterns. Considerable care has to be exercised in molding, rapping and drawing the patterns, as the valves when cast must pass limit gauges of 1/16-inch margin before proceeding to the machine shop for grinding on the face and to fit the buckles.

BUFFALO CONVENTION

The convention of the American Institute of Metals and the allied associations, together with the exhibition of the Foundry and Machine Exhibition Company, will positively be held in Buffalo, N. Y., during the week of September 23, 1912. This change of date from the usual time in June, so far as we have heard, has been welcomed by association members and manufacturers alike. For one thing, the weather is likely to be more conducive to attending meetings and exhibitions at the close of the summer than at the beginning. Another point is that business in general is getting ready for the fall expansion rather than preparing for a summer slack, as is usually the case, and this alone should increase the attendance. Visitors to a September exhibition will go home with their minds full of the new things that they have seen, and will be more likely to put into action at once ideas gathered, rather than to have these ideas dulled into memories because of a vacation taken soon after a June convention.

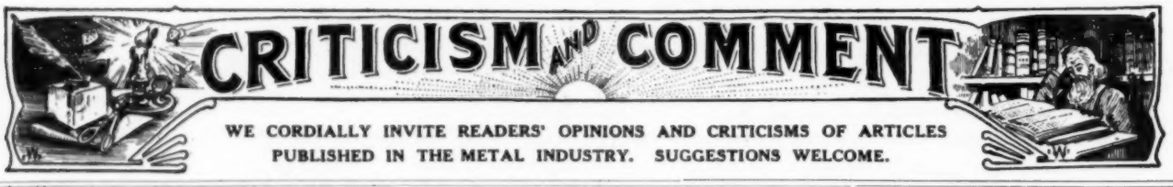
All indications point, as expressed by Secretary Hoyt in the Association and Societies columns of this issue of THE METAL INDUSTRY, to a record breaking

exhibition, and the meetings of the various societies promise to be full of interest to all who attend. The meetings, at which the papers will be read and discussed this year will be held at the several hotel headquarters of the participating societies. This seems to us to be a good move, and should result in the production of a wealth of good material for preservation in the transactions of the various organizations. All that now remains is for the secretaries to get out the papers to be read far enough in advance to admit of prepared discussion. The members intending to contribute, or who have signified such intention, should by all means bear this in mind and help their secretaries along by handing in their papers early.

The American Institute of Metals is now a fact, and congratulations are due to the management of the American Brass Founders' Association for the change in name. It is to be hoped that by this means the membership list will be greatly augmented to the extent that the new scope of the society warrants. The transactions of the American Institute of Metals should in the future be as valuable to the members as those of the sister association—the Institute of Metals of Great Britain. To this end there should be more reports of a technical character than has been available in the past, and committees to take up some investigation work should volunteer or be appointed. This would be in accord with the committee of the Institute of Metals in England, now at work on the corrosion of metals and its causes.

While the exhibition in itself covers a good deal of ground, it has always seemed as though it could expand and throw its influence over the whole field of the metal-producing business. We refer to the finishing end. Nowadays a great many concerns producing articles of metal do their own finishing. This involves cleaning, plating, polishing, lacquering and other forms of finishing. Why is there not as good an opportunity offered at this exhibition for a plating and polishing house to show its wares as there is for a molding machine manufacturer or a dealer in foundry supplies? The foundry and finishing departments are closely allied, one needs the other and each helps or can help the other. At times there is considerable friction in a concern between the foundry and the plating room, which can be easily eliminated if proper opportunity offers.

The annual convention of foundrymen and the exhibition of foundry machinery and supplies offer just this opportunity. Here on common ground, platers, finishers, molders and metal mixers can meet and exchange thoughts and have discussions as to ways and means of solving the many problems of the trade. Here a better understanding can be had of the troubles each has to contend with, and a study made of the machinery, apparatus and supplies used in all branches of the trade. If the manufacturers of dynamos for plating, polishing and finishing machinery and platers' supplies in general will exhibit their wares and the electro-platers will attend the convention and exhibition, nothing but great good can come of it. We hope to see the entering wedge started this fall by the National Electro-Platers' Association of the United States and Canada sending a delegation, and by some of the platers' supply houses making a display of their goods.


CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES
PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

STANDARD SPECIFICATIONS

To the Editor of the Metal Industry:

I can assure Mr. Lawrence Addicks in reply to his letter in The Metal Industry, April, 1912, that there is not the remotest chance of the standard copper specifications as proposed by the American Society for Testing Materials,* being accepted on this side of the Atlantic, and the question is not closed in America. I have received several letters from large firms in the U. S. A., entirely agreeing with my criticism.† American manufacturers should bear in mind that arsenical copper is far superior to pure copper for tubes, rods and sheets, and that brass made from all electrolytic copper is inferior to that made from a mixture of coppers, and what is of far more importance commercially, brass made from a mixture of coppers will stand more work in the rolling mills, and enables manufacturers to obtain a bigger output. Surely this fact alone is worth the serious attention of American brass and copper sheet manufacturers, to say nothing of the superior wearing quality of their goods. The only comment I will make at present on Mr. Stone's letter‡ is that a method may give concordant results, but they may be totally inaccurate. A typical case is the estimation of iron in gun metal by the method of separating tin as oxide in a nitric acid solution.

Ernest A. Lewis.

Birmingham, England.

*Published in The Metal Industry, July, 1911.
†The Metal Industry, September, 1911.
‡The Metal Industry, April, 1912.

HOT-ROLLING 70-30 BRASS

To the Editor of The Metal Industry:

In reply to a correspondent in the May number of The Metal Industry it is stated that it is not possible to roll 70/30 brass hot practically. It is quite possible to roll this metal hot by using electrolytic copper and electrolytic spelter and adding 0.5 per cent. manganese as a de-oxidizer. I have rolled several tons of this metal with the following mixture:

Electrolytic copper	68 lbs.
Cupro-manganese (25 per cent.)	2 "
Brunner Mond electrolytic spelter	30 "
Total	100 lbs.

The metal is more expensive than ordinary 70/30 brass. It rolls well at a bright red heat. It can also be rolled on to steel to form a compound metal by the same process as copper can be welded to steel.

Ernest A. Lewis.

Birmingham, England.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY

ALLOYING

Q.—Please give us a formula for an aluminum alloy, which will have the least possible shrinkage and be suitable for making patterns and matchplates.

A.—The alloy composed of seven parts of copper and 93 of aluminum is the best aluminum alloy for making patterns and matchplates. Low shrinkage may be obtained by avoiding overheating and pouring with very large gates at a low temperature.—J. L. J.

Q.—Will you kindly publish formulas for Britannia metal for spinning, also one for casting?

A.—The following Britannia metal formulas will prove satisfactory to you. For sheet Britannia for spinning: Tin, 91 parts; antimony, 8½ parts; copper, 1½ parts. For casting: Tin, 90 parts; antimony, 9½ parts; copper, ½ part. A good flowing, cheap Britannia, frequently termed solder, consists of tin 50 parts, lead 45 parts, antimony 5 parts. A mixture which is frequently used for a cheap metal for casting consists of lead 87 parts, Cooksons antimony 13 parts. This is the usual alloy for antimonial lead castings, and is used very largely by manufacturers of art metal castings. The following formula is also frequently used, as it produces a harder casting: Bertha spelter, 98 parts; aluminum, 2 parts.—C. H. P.

BRAZING

Q.—Kindly give me a formula for cold brazing.

A.—Take ¼ ounce of fluoric acid, 2 ounces of brass filings and 1 ounce of steel filings. Put the fluoric acid into an earthen or leaden vessel, and with it place the filings. Touch the parts required to be brazed with a portion of the mixture, and put them together. The result will be a point almost as strong as could be obtained by the difficult and tedious method of every day brazing. Care must be taken to keep the acid from touching the hands or clothes, and the fumes from being inhaled.—P. W. B.

CEMENTING

Q.—Please furnish me with a formula for cementing brass to glass.

A.—To make a strong cement for joining brass to glass take one part of caustic soda, 3 parts of powdered resin, 5 parts of water, and mix well. Into this mixture stir about one-half its weight of plaster of paris; mix thoroughly and apply to surfaces free of grease, which will in about half an hour be securely cemented together. If the cement is not required for setting quickly, white lead may be substituted for the plaster of paris. Another good cement for the above purpose is an alloy of 8 parts of lead, 4 parts of tin and 5 parts of bismuth. This alloy, though melting at about the boiling point of water, is very tenacious, and is an excellent cement for joining glass to most metals.—P. W. B.

FINISHING

Q.—Can you tell me how to obtain a silver-green finish, so that the high lights will show silver and the background green?

A.—It is impossible to produce a true green upon silver by any method of chemical coloring. The light green, pink and other tones noted upon buckle work is accomplished by applying very dilute aniline colors with pencil camel's hair or sable brushes, and is usually done after lacquering, so that the color softens the lacquer and becomes part of it.

It occurs to us that you may possibly refer to what is known as coffin hardware green. Manufacturers of such harware use this color instead of the gray because it does not attack the silver so rapidly, thus avoiding a more heavy deposit. The method is to silver plate the articles in the regular manner and not scratch brush them. Then immerse in a cold liver of sulphur solution to which is added a small amount 20 per cent. ammonia until the green is produced, then remove and wash and dry from the cold water; then relieve. Avoid using hot water, as the color has a tendency to darken when immersed in very hot water.—C. H. P.

GALVANIZING

Q.—What is the best protective coating for iron or steel so that they will not rust in salt air?

A.—For your purpose zinc is the best coating, as copper will not protect the surface when coming in contact with salt air. First coat the articles with zinc, then scratch brush after plating, using a soft steel wire scratch-brush. Then copper plate for a sufficient length of time to prevent the action of the nickel solution upon the zinc, unless a special solution is used for nickel plating direct upon the zinc. The zinc bath should consist of the following:

Sulphate of zinc	1½	lbs.
Sulphate of aluminum	4	ozs.
Common salt	2	ozs.
Water	1	gal.

A voltage of not less than 6 gives the best results.—C. H. P.

OXIDIZING

Q.—How is the light wine oxidize finish produced?

A.—For brass and copper plate, polish the articles to a cut down finish, then cleanse and lightly scratch-brush, wash in clean water, then immerse in a solution consisting of two ounces of liver of sulphur to the gallon. This should be maintained near the boiling point. Immerse the articles for a few seconds, then remove and wash. The result will be a deep orange tone. Now dry out and scratch-brush dry. The brass will then have a brownish tint. Immerse a second time, wash and dry, and you should then have the tone you require. If you desire more lustre, light scratch-brush a second time. If a more reddish tone is required, then the brass surface must be coppered in the regular way; then scratch-brushed, washed and immersed in a solution consisting of one-quarter to one-half ounce of liver of sulphur to the gallon and used cold. Immerse the copper plated articles in the dip for a second or two; then remove, wash and dry. Then scratch-brush with a soft brass wire brush or one much worn. The same brush should also be used for the brash finish as heretofore mentioned. After the brushing the tone may be what you require; if not, immerse a second time, but this second immersion must be done quickly, or a solution of one-half the strength should be used. Then rewash and dry, and rebrush. One of the other of these methods should be what you require. A little experimenting will give you results. The articles should be finally lacquered in the usual manner.—C. H. P.

PLATING

Q.—What is the correct name for the yellow substance which accumulates at the bottom of nickel solutions? Is it a detriment or a benefit to remove it?

A.—The yellow mud usually found in the bottom of nickel tanks consists largely of iron, but may contain a little nickel

in the basic form with other impurities. It is of no value, neither is it a detriment, only so far as when an excess of it is contained in the solution and becomes disturbed; then the nickel deposit looks as though coated with iron rust. Some platers prefer to let a certain amount of this mud remain, claiming a benefit to the solution, but why has never been explained. It is somewhat like the controversy between cleaned and uncleaned nickel anodes. Some platers remove the sediment, and others allow it to remain.—C. H. P.

Q.—My brass solution does not deposit evenly. Can you give me a remedy? Also publish a formula for a dark green verde solution.

A.—Make up a good strong solution of cyanide of potassium; then add all the carbonate of copper the solution will absorb, then add this to your brass bath, noting the results until a good uniform deposit is obtained. Your solution evidently lacks copper (add very little zinc). If at any time the deposit shows a reddish tinge, dissolve a pound of zinc in a quart of strong ammonia and add a little until the proper color is produced. Sodium bisulphite is used as a conducting or reducing salt, as it reduces the copper from the anode, producing cuprous sulphite, which is more readily soluble in the cyanide. Carbonate of soda is of no value in the copper bath, but in the brass bath it assists in reducing the zinc and in plating iron it helps to produce a brighter deposit.

On page 479 of the November issue of THE METAL INDUSTRY a good formula for a green upon brass or copper is given. This should be applied with a brush, and if a mottled appearance is required, give a stippling motion to the brush when dry and a good color. The surface is waxed in the regular manner, using a soft brush and beeswax.—C. H. P.

Q.—Can you advise me where I can secure the details of a first-class system for ascertaining the cost of articles to be plated?

A.—No cost system has ever been evolved for a plating department. The method to pursue to obtain the approximate cost would be the same as in any other line. The plant would have a fixed value, allow interest and depreciation on such a value—interest at 6 per cent. and depreciation 10 per cent. Keep exact cost of material used, for several months; exact time spent on all orders going through the plating department, starting from the acid dipping to polishing department, to plating to lacquering or coloring. Then add to the cost of labor the cost of material, such as anodes, chemicals, lacquers, etc. The cost of labor and material should be doubled,, that is if an article costs five cents for finishing it should be figured as ten cents. Add 25 per cent. for interest, profits and depreciation to the cost of labor and material. Some concerns figure as low as 75 to 100 per cent. in addition to the cost of labor and material; others in proportion to their non-producers figure from 100 to 150 per cent.—C. H. P.

Q.—On page 313 of your July, 1911, issue you make a suggestion of adding sal ammoniac to a nickel solution. We nickel plate brass articles, which have been polished and buffed on wheels, and wonder if the use of sal ammoniac would be advisable to soften our nickel solution. We are having trouble with the work peeling, no matter how carefully it is scoured. Also when using an ammeter on a nickel solution where three separate tanks are used, is it necessary to have a separate ammeter for each tank, or will one suffice.

A.—Sal ammoniac or common salt is added to a nickel solution in the proportion of two to four ounces to each gallon of solution to soften the deposit. We would suggest that you test your solution for alkalinity with red litmus paper; if it turns blue your trouble may be due to this cause. In such an event add eight ounces of sulphuric acid, dissolved in water, and add to each 100 gallons of solution and mix thoroughly. Retest, and if the neutrality is still alkaline, add a small amount more acid water, but be careful not to add more than will give a very faint acid reaction when blue litmus paper is immersed in the solution. Try this method first before adding the sal ammoniac or salt, because peeling of the deposit is frequently caused by alkaline or acid solutions. If the solution is acid to test, then ammonia may be added instead, but use the utmost care in making these additions to avoid further troubles.

Relative to the use of ammeters, one will be sufficient for any number of tanks, providing you have the necessary cut-outs and switches. It is not an ammeter that you require, but a voltmeter. A voltmeter determines the constancy of the current, and with the proper rheostats the volume of current can be very easily controlled. But you must have the pressure in volts to give the required results at your tanks, let the amperage be what it may.—C. H. P.

POLISHING

Q.—Will you kindly inform us how we can put a high polish on platinum work, such as chains?

A.—The articles should be sand buffed in the usual manner, using fine sand or fine pumice stone and oil; or cut with a crocus composition. Afterwards polish with jewelers' gold rouge, mixed with kerosene oil. Now wash in soap water, such as gold dust powder, adding a little ammonia and using warm. Dry out in boxwood sawdust and recolor on a canton flannel buff, using a little gold rouge and alcohol for the purpose. In some instances the links are burnished after the first coloring. Rolled plate and gold chains are burnished by the steel ball method by many manufacturers, but in your case this method could not be used unless you had a large amount of work to do at one time.—C. H. P.

RUST PROOFING

Q.—We are black dipping small steel articles. The process we use is to boil them in phosphate or iron, but without the desired result, as this mixture eats in the surface of the metal making it rough and turns the metal a light gray. We should be pleased to have you give us, through your Shop Preblems, a remedy for this trouble.

A.—From the information furnished we should judge that the phosphoric acid solution did not contain sufficient iron and became too concentrated by the loss of water by evaporation. The new process for this finish consists of preparing a solution of

Granulated zinc	6 ozs.
Phosphoric acid	1 pint.
Water	1 pint.

The solution should be warmed sufficiently to dissolve the zinc. For use, add one ounce of the above concentrated solution to each gallon of water. Use an iron kettle and boil the cleansed articles for one hour or less at a low boil, replacing the water lost by evaporation. When the black deposit is produced the articles are washed in boiling water and then given a linseed oil coating as previously given in the preceding formula. It is stated that this bath can be used as a regular plating bath by taking the proportions given, using as a cold solution. Anodes of wrought iron should be used with a voltage of two to three and amperage according to the cathode surface. The manipulations of the finish afterward should be the same as in the boiling process.—C. H. P.

TINNING

Q.—We are having a great deal of trouble tinned work turning yellow after it has been packed for a short time. We follow the usual routine methods. Can you suggest a remedy?

A.—In going over your methods of tinning we cannot suggest many improvements. A solution of sal ammoniac can be used in the place of the usual chloride of zinc flux, or a solution of equal parts of muriatic acid and water; then add two or three pounds of sal ammoniac to each gallon. Your other methods appear to be satisfactory. The yellow color noted may be due to superficial oxidization of the surface. To overcome this, after potashing, use a cyanide dip cold, say about four ounces of cyanide to each gallon of water; then dry out in your usual method. If the stain is due to water, we would suggest that you add to your boiling water, one ounce of platers' compound to each gallon of water, and renew the entire water frequently. This method should overcome the discoloration.—C. H. P.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,022,465. April 9, 1912. Graphite Metal and Method of Producing It. R. T. Cole, South Portland, Me.

This invention consists of an improved lubricating composition and the method of producing it. The object of the invention is to produce a metal for bearings which shall contain finely divided graphite inclosed in and uniformly distributed through a metal matrix. The method is characterized by a preliminary preparation of graphite flakes, which renders them easily wetted by a fluid metal and by conditions which preserve this characteristic of the graphite until the metal matrix is solidified.

The process proceeds by coating the individual flakes or particles of graphite with a metal which has a higher melting point than the matrix metal, and then impregnating the matrix metal with a desired proportion of these coated graphite flakes, preferably subjecting the mixture to pressure while the matrix metal is fluid, and then allowing the whole to solidify, when the graphite will be uniformly distributed through and embedded in the metal, and producing the composition as shown in cut.

1,023,291. April 16, 1912. Coloring Metals. S. Axelrod, Oberschöneweide, Germany, assignor to General Electric Company, New York.

The patent covers: The process of producing a coating upon metals, which consists in providing the metals with a surface coating of cobalt salt and subsequently heating the metals more or less strongly according to the shade desired; the process of producing a brown to black surface coloration upon aluminum, which consists in providing the aluminum with a surface coating of a cobalt compound, heating the metal, and repeating this process according to the shade desired; the process of surface-coloring metals, which consists in applying upon the metals a neutral solution of cobalt salts and heating the same more or less strongly, according to the shade desired.

1,023,604. April 16, 1912. Metal-Casting. E. Weintraub, Lynn, Mass., assignor to General Electric Company, New York.

This invention relates to the purifying and casting of metal and is applicable to copper or its alloys, and to other metals, as for example silver. What the patent covers is as follows: The method of treating metal with which boron does not combine, which consists in adding to the metal while molten a non-metalliferous boron material in a condition capable of combining with gaseous impurities, the amount of said material being slightly in excess of that required to eliminate the impurities.

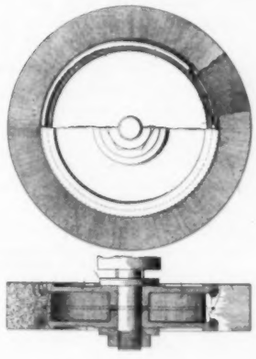
The method of treating copper which consists in incorporating therein, while molten, a boron material in a condition capable of combining with oxygen and of a quantity sufficient to free the resulting product from undesired compounds and gases. The method of treating molten copper bearing metal, which consists in incorporating therewith boron material in a state of oxidation lower than boric anhydrid. The method of increasing the conductivity and soundness of cast copper, which consists in incorporating with the copper while heated to a temperature of about 1100°-1350° C. a material containing boron in an oxidizable condition. A firm, dense casting of high electrical conductivity consisting of copper freed from dissolved gases and containing boron material in traces, uncombined with copper.

1,023,661. April 6, 1912. Pyrophorous Metal. F. Krieger, Berlin, Germany, assignor to Zundmetal-Gesellschaft M. B. H., Berlin, Germany.

This invention relates to an alloy of manganese and antimony constituting a pyrophorous metal. Hitherto these alloys have not been practically employed. Experiments have proved that pure or commercial manganese will form an alloy with antimony in almost any proportions, if antimony be added, for example, to the molten manganese. For the present purpose alloys containing more than 10 per cent. of antimony or of manganese are effective. The patent covers a pyrophorous metal, comprising an alloy of manganese and antimony, containing more than 10 per cent. antimony, with addition of chromium up to 20 per cent.

1,023,807. April 23, 1912. Grinding and Buffing Wheel. L. H. Brinkman, Glen Ridge, N. J., assignor to American Oil and Supply Company, Newark, N. J.

This is a wheel, shown in cut, for grinding and buffing, which comprises a peripheral or grinding section of individual transverse pieces of cloth of abrasive character, such as emery cloth, a wire band or rod on which said pieces are strung and which aids in retaining them in form to create a circular peripheral section. Hoops or rings of wood or the like set into recesses in the opposite sides of the inner portion of said peripheral section and securely fastened therein by glue, and opposite removable hub-disks adapted to fit within opposite sides of said peripheral section and engage the outer or exposed side surfaces of said hoops. The inner edges of said pieces of abrasive material constituting the peripheral section being strongly glued together, and said disks being removable and creating a hub adapted to pass upon and be secured to a lathe-spindle or the like. The peripheral or grinding section of the wheel will, of course, become worn out after continued use, and when this happens the remaining part of said section will be removed from the disks and a new peripheral section inserted.



1,024,561. April 30, 1912. Composition of Matter. J. J. Davoren, Denver, Colo., assignor of one-half to W. T. Davoren, also of Denver.

This invention relates to a new composition of matter to be used principally in the manufacture of machine parts and its object is to provide a metallic substance in which softness is combined with tenacity.

The composition consists in its preferred form of the following ingredients combined in the proportions stated, viz.:

Lead	50 pounds.
Copper	50 pounds.
Arsenic	½ pound.
Phosphorus	1 ounce.

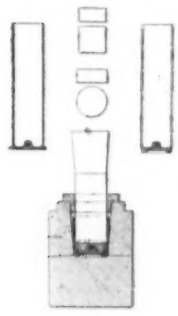
The above component parts are combined by melting the metals and adding the non-metallic elements to the molten mass, after which the latter is poured into a suitable mold. The substance thus produced is ready for instant use when cooled.

1,024,693. April 23, 1912. Process of Inlaying Metal in Masses, Such as Celluloid, Ebonite and the Like. Jacob Kauffman, Wilmersdorf, near Berlin, Germany.

A process of inlaying metal in plastic masses such as celluloid, ebonite, wood, pasteboard and the like, which consists in providing the top side of a solid sheet of metal with a drawing in

acid-proof paint, in mounting the sheet of metal with its bottom side on the plastic mass, in subsequently placing the sheet of metal together with the mass in a corrosive bath and leaving the same therein until all the surface of the sheet unprotected by the paint has been dissolved, in removing the mass with the adhering metal from the bath, and in then pressing the metal left adhering to the mass into the latter.

1,024,840. April 30, 1912. MANUFACTURE OF CARTRIDGE CASES OF BRASS OR OTHER ALLOYS OF COPPER. Heinrich Ehrhardt, of Dusseldorf, Germany, assignor to Rheinische Metallwaaren und Maschinenfabrik, of Dusseldorf-Derendorf, Germany, a corporation of Germany.



This is an invention for the manufacture of cartridge cases and is covered by the following claim:

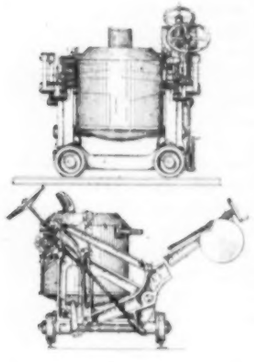
The process of making cartridge cases, which consists in forming a prismoidal blank of cartridge metal, as shown in cut, consisting of copper and zinc, said blank having a maximum diameter not substantially greater than the diameter of the finished cartridge case, and having a cubic contents of metal substantially equal to that of said finished case, heating said blank red-hot, and while red-hot, forging said metal between dies into a cylindrical cup-shaped body having a downward-extending cylindrical flange at its bottom and an upward-extending projection on its inner face to form a detonator chamber, then cooling said cup-shaped blank, drawing out the walls of the cup-shaped body to form the walls of the cartridge case and then forcing the downward-extending cylindrical flange outward radially to form the rim of the cartridge case.

1,025,131. May 7, 1912. ALLOY. J. W. Donnell, Evanston, Ill.

This patent covers an alloy designed for use in making a safe burglar-proof. The walls of the safe are made of the alloy which contains cast iron, copper and platinum in the proportions of about eighty per cent. cast iron, about twenty per cent. copper and about eight-tenths of one per cent. platinum.

1,025,515. May 7, 1912. PORTABLE FURNACE. Merrill Davis, Watertown, N. Y., assignor to James B. Wise, also of Watertown.

This invention relates to improvements in portable furnaces or crucibles, designed for use in melting various kinds of metals, and the invention relates particularly to a tiltable and rotatable furnace adapted for pouring the molten metal directly into the molds.



The object of the invention is to provide a novel, simple and convenient furnace, as shown in cut, of the class which is capable of being fired by gas, oil, coke or other suitable fuel, and the firing controlled by either natural or mechanical draft.

A further object is to provide a self-firing furnace having a pouring spout for discharging the metal directly into the molds or chills, without the use of ladles or dips.

A further object is to provide a furnace adapted to stand erect for charging the same, and in means for supporting and locking the furnace in said position.

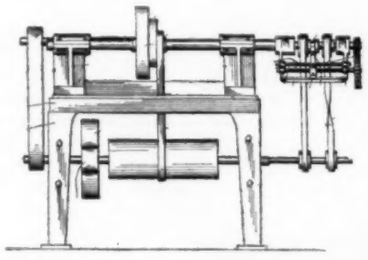
A further object is to provide a furnace which may be tilted into an inclining position for skimming the metal preparatory to pouring the same, and in means for supporting and locking the furnace in the said position.

1,025,760. May 7, 1912. ELECTROPLATING PROCESS. F. J. McElhone, Jersey City, N. J.

In practising the process according to the present invention, an impression from the engraving or type is taken in a case of wax or similar plastic material covered with graphite or a similar conductive facing. After the impression is taken the case is cut down and built up in the manner well known in the art. The face of the case is then dusted over lightly with dry graphite. Then treat the face of the case with a solution having the following composition: 1 gallon of water, 2 lbs. of graphite, 100 grs. of pyrogallic acid. This mixture may be applied by means of a brush or a force-pump. The action of the acid appears to be beneficial because it tends to prevent the formation of bubbles on the face of the case.

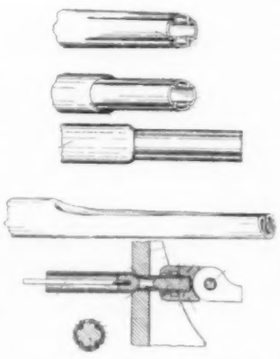
1,025,417. May 7, 1912. GRINDING AND POLISHING MACHINE. W. F. Miller, Fond Du Lac, Wis.

This invention relates to grinding and polishing machines and particularly to means, as shown in cut, for driving a buffer or grinding wheel as well as to means for moving said wheel laterally in opposite directions, the invention further residing in novel means for shifting or controlling the buffer controlling device whereby the operation is carried on automatically.



A further object of this invention is to produce a machine of the character noted which will possess advantages in points of simplicity, efficiency and durability proving, at the same time, comparatively inexpensive to manufacture.

1,025,568. May 7, 1912. MODE OF HOLDING TUBES DURING THE OPERATION OF DRAWING THEM. H. Higgin, Newport, Kentucky, assignor to the Higgin Manufacturing Company, of Newport, Ky.



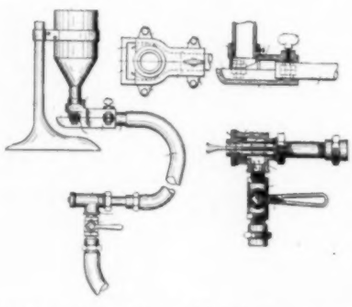
Heretofore the mode of connecting the grappling mechanism to the tube to be drawn has caused a large loss of material amounting to a large per cent. of the value of the tube itself.

The object of this invention is to prevent such waste, and to diminish the amount of such loss to a minimum.

The nature of this invention consists in a new and useful mode, as shown in cut, of forming the end of the tube to be drawn so that the gripping mechanism shall have a good and sufficient hold upon the end portion of the tube, and shall maintain such hold without crushing or in any wise damaging the tube.

1,026,688. May 21, 1912. SAND BLAST DEVICE. Walter Macleod, Fort Thomas, Kentucky, and Wm. Hext, Cincinnati, Ohio.

This invention relates to sand blast devices, as shown in cut, wherein sand is taken up from a collector by suction created by compressed air, and is ejected by the compressed air against the object which is to be sanded.



The object of the invention is a sand blast device wherein the sand, when taken up at the collector is kept together and is carried along through the hose, or conduit, in a condensed stream, and is ejected from the nozzle in a central condensed jet, which is surrounded by a jacket of air, so as to prevent the nozzle's being cut by the sand.

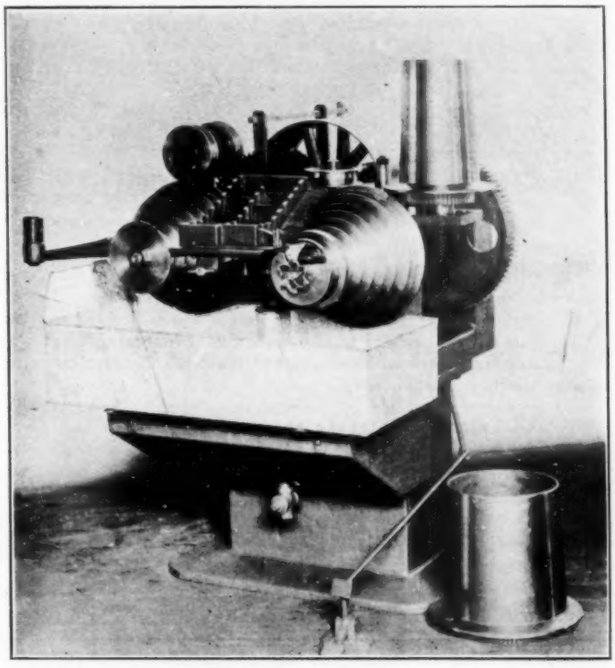
INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

CONTINUOUS WIRE MACHINE

This machine is for drawing soft brass or copper wire on the continuous system from No. 12 (2.05 m/m) to No. 18 or No. 20 (1.02 m/m or .81 m/m) B. & S. gauge. It is intermediate between a rod drawing and fine wire drawing machine, but is not necessarily strictly confined to the range of sizes specified; for example, from No. 9 (2.09 m/m) to No. 16 (1.29 m/m) B. & S. gauge, has been drawn regularly in commercial practice.

The accompanying photograph will give a general idea of the design of the machine. Two parallel shafts, connected by a simple train of spur gears, each carry a grooved, stepped drawing cone of chilled cast iron which serves as a capstant for the drawing operation. An inclined die box rests between these cones with enough recesses to permit considerable latitude in the arrangement of the drawing dies. This box is at all times flooded



CONTINUOUS WIRE DRAWING MACHINE. MANUFACTURED BY THE MORGAN CONSTRUCTION COMPANY, WORCESTER, MASS.

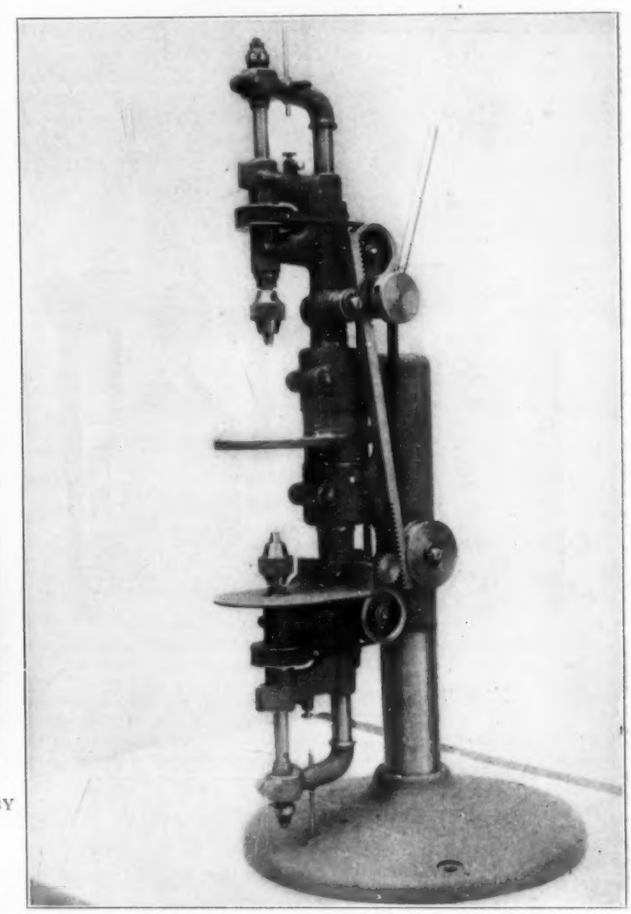
with drawing liquor by a pump separately driven by a small pulley, shown immediately back of the right hand drum, the flow of liquor being controlled by the valve handle shown in front of and below the box. The liquor falls from the die box into the base of the machine and is used over and over again.

The latest type of machines have the slope of the drawing cones reversed as it has been found that the machine is more easily threaded up when so arranged. The drawing block which receives the finished coil is provided with an extension top. It will be noticed that in the photograph two blocks are shown, only one size, however, is provided unless specially mentioned. At the front end of the right hand cone a drawout drum is provided which hangs freely on the shaft until locked by the hand wheel at its center. A temporary die holder, shown at the front of the die box, is provided for this drawout work. The drive is by belt through a tight and loose pulley from a countershaft above. The belt shifter is controlled by a foot treadle. The machine is self-contained and can be set up without special foundations on any reasonably heavy mill flooring.

The above machine is manufactured by the Morgan Construction Company, engineers, Worcester, Mass.

BEAD DRILLING OR COUNTER-BORING MACHINE

The machine shown in the cut was designed by the Langelier Manufacturing Company, Providence, R. I., especially for counterboring the string holes both sides of necklace and other beads. It consists essentially of a rigid column set into a wide base for attaching to the bench, supporting two sensitive drill frames so disposed that the drilling spindles work towards each other when



BEAD, DRILLING OR COUNTER-BORING MACHINE. MANUFACTURED BY LANGELIER MANUFACTURING COMPANY, PROVIDENCE, R. I.

manually operated by the lever shown or by a foot feed passing through the bench and operated by treadle. The main driving pulleys are on the opposite sides of the machine. (Not shown in the photograph.) The driving shaft extends through the column and drives both the drilling spindles by means of an endless belt.

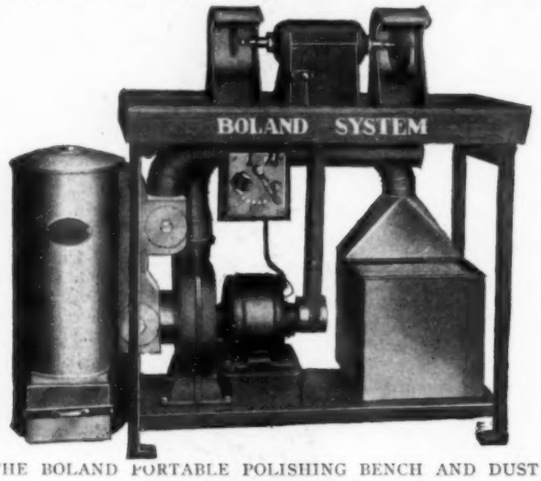
The work is mounted on a low, flat fixture, set on the top of the fixed table shown midway between the drill chucks. The top of this table is exactly central between the drill points. The table may be swung to one side if desired. The two spindles are actuated through pinions, and mashing into a connecting rack. By this means the countersinking both sides of the bead is kept uniform. One-half inch vertical adjustment has been provided to each spindle to obtain the proper cutting position to the drills

on beads of different sizes. The accuracy can be further controlled by means of the vertical depth gauges shown passing through the frames of the machine. These gauges may be set to any required distance and closely regulated by means of a knurled adjusting screw or anvil on which the tips of the gauges strike. The main specifications of the machine are as follows:

Greatest distance from chuck to top of table.....3¾ inches.
Center of spindle to edge of column.....1¾ "
Vertical movement of spindles, each..... 2 "
Height from bench to top of table..... 17 "
Diameter of table.....4¼ "
Vertical depths gauge provided with each drill for counterboring to an even distance every time.
½-inch vertical adjustment provided for each spindle.
Rack and pinions of steel.
Bench space occupied.....15 inches x 17 inches.
Weight, 114 lbs.

PORTABLE POLISHING BENCH AND DUST COLLECTING SYSTEM

The Boland Portable Polishing System, manufactured by H. J. Astle & Company, Providence, R. I., metal workers and manufacturers and dealers in blowers, exhaust fans, etc., is designed to meet the requirements of those who do not need a large polishing system—such as small jewelers, repair shops, schools, hotels and hospitals. The machine is provided, as shown in the cut,



THE BOLAND PORTABLE POLISHING BENCH AND DUST COLLECTING SYSTEM.

with an individual motor of one-half horsepower which operates the lathe and exhaust fan. It is claimed by the manufacturers that one big advantage of this system is that practically all of the dust from polishing operations is trapped before it reaches the exhaust fan and by doing this there is no danger of the fan wheel being thrown out of balance. The new system, for which patent has been applied, is so easily cleaned out that it takes only a few minutes to get the dust ready to be shipped to the refiner.

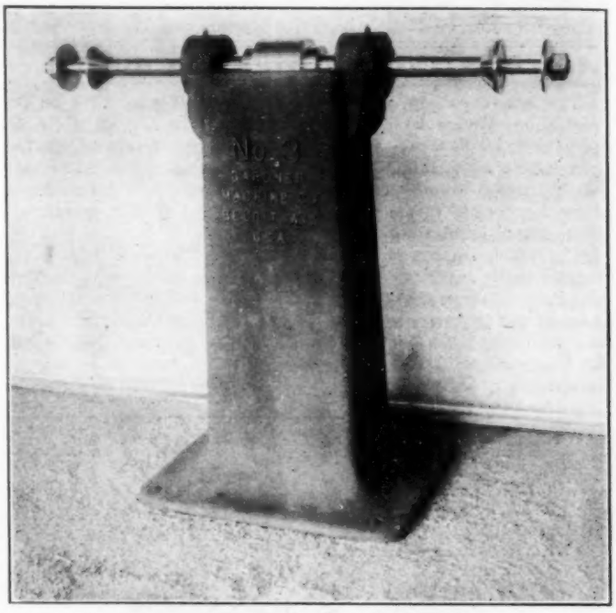
Some of the more important items of the specifications of this system are as follows:

Length of bench and dust collector, 4 feet 6 inches outside.
Width of bench, 21 inches outside.
Height of bench, 2 feet 11 inches.
Length of double spindle, 24 inches.
Height of spindle from bench, 8½ inches.

NEW BALL BEARING POLISHING STAND

A new ball bearing polishing stand has just been put on the market by the Gardner Machine Company, Beloit, Wis., manufacturers of disc grinding machinery. This machine and countershaft are fitted throughout with ball bearings. Diameter of spindle at radial load is 2 inches and tapers down to 1¾ inches diameter. The arbor is 1¼ inches diameter, forming a shoulder for the 4½ inches diameter wheel collar. Spindle extends 15 inches on each side of base and is 39 inches from floor. Spindle pulley is 5 inches diameter x 4½ inches face. The two radial ball bearings are completely protected by dust or grit by special cases and are lubricated by compression grease cups using a light grease. Spacing collars are furnished to be used when various width wheels are required.

The countershaft hangers are of the latest approved ball bearing type and are fitted with two adapted bearings. Tight and



BALL BEARING POLISHING STAND. MADE BY GARDNER MACHINE COMPANY, BELOIT, WIS.

loose pulleys are 8 inches diameter x 5½ inches face, the loose pulley being fitted with 2 radial ball bearings. The driving pulley is 18 inches diameter x 5 inches face, and at a speed of 750 r. p. m. drives the machine at 2,700 r. p. m. The entire weight of the machine, which the manufacturers call their No. 3, complete with countershaft, is 600 pounds.

NEW TUMBLING BARREL

The tumbling barrels here illustrated are designed for polishing by either the wet or the dry process of tumbling various kinds of small articles that are made of wire or sheet metal. The barrels while rotating also oscillate, and the combination of these motions

NEW TUMBLING BARREL OF HENDERSON BROTHERS. WATERBURY, CONN.

is decidedly advantageous at it causes the work to mix together thoroughly. Another advantage is that one barrel counterbalances the other. When certain kinds of articles are being tumbled for which the oscillating motion is unnecessary that motion can be stopped and the barrels held rigidly in the horizontal position. The doors of the barrels may be either in the ends or in the sides, whichever is most convenient for any given class of work. These barrels for which application for patents have been made are manufactured by Henderson Brothers, builders of tumbling barrels, Waterbury, Conn.

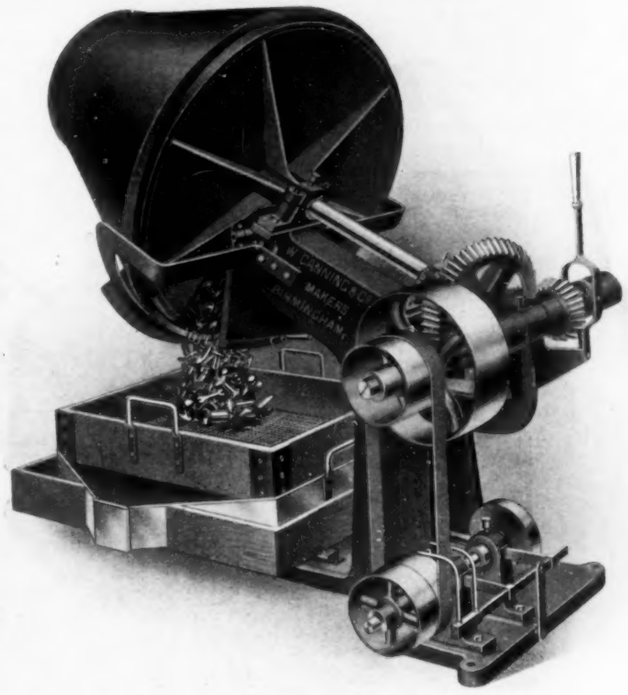
THE CANNING HOT SAWDUST DRYING-OUT BARREL

The barrel shown in the cut is claimed to be a great improvement on any mechanical means previously offered to the trade for drying out in sawdust small articles which have been plated in bulk in mechanical plating barrels, dipped work, etc. The barrel itself is made of galvanized iron with a cast iron bottom, and fitted with a water jacket to prevent sawdust from burning. A Bunsen burner is provided for heating the water jacket. The barrel is mounted on a substantial cast iron pedestal, and is fitted with a suitable pulley for driving, necessary bevel gear, self-contained countershaft with belt-shifting device for starting and stopping the riddling tray, and a clutch for starting and stopping the barrel. The bottom of the barrel is fitted with a hinged door for emptying, the work and sawdust falling into the special riddling tray which fits into a galvanized iron pan arranged with a mouth for conveniently emptying the sawdust back into the barrel.

The riddling tray is operated from the foot of the pedestal as shown in the illustration by means of the countershaft shown.

The water jacket is provided with two screwed plugs for filling with water, emptying, and washing out. The riddling of work and sawdust is done automatically instead of by hand. It is possible to run the barrel only, or the riddling tray only, or both barrel and riddling tray together, or have both stationary, by means of the clutch and countershaft fitted to the pedestal, the belt driving the barrel pulley continuously. The heat can be regulated to a nicety, and 4 gallons or a handful of work can be efficiently dried out at a time. The movement and expeditious drying out by means of this barrel improves the finish of the work. The specifications of the barrel are as follows:

Inside diameter of barrel at base, 26¾ inches; inside diameter of barrel at mouth, 13½ inches; inside depth of barrel, 18 inches; diameter and face of driving pulley, 12 inches diameter by 3 inches face; approximate speed, driving pulley should be run at 50 r. p. m.; height overall, 4 ft. 7½ inches; width overall, 2 ft. 6¼ inches; depth overall back to front, 4 ft. 10½ inches; approximate weight, 6½ cwts. These barrels are manufactured and sold by W. Canning & Company, Birmingham, England.



THE CANNING HOT SAWDUST DRYING-OUT BARREL.

A REMARKABLE SCIENTIFIC DISCOVERY

DEPOSITION OF PLATINUM AS HARD AS STEEL BY FRICTIONAL PRECIPITATION.

BY CHARLES H. PROCTOR.

The remarkable discovery that platinum can be deposited upon any baser metal as hard as steel by frictional precipitation is one of the most important developments in the scientific world of the present year. With the price of platinum and iridium the hardener of platinum, continually soaring upwards, owing to the continual increased demand for metals and the restricted output, to maintain high prices; this process of depositing hard platinum will prove of untold value to the scientific and commercial world.

The uses of platinum are constantly on the increase, and no reduction in cost will ensue as long as the output is controlled by the European syndicate, unless some unusually large deposits of the metal should be discovered in this country or in the United States of Columbia, South America or in Canada. The price of the metal will probably reach fifty dollars per ounce the latter part of the present year, if the demand for the metal continues at its present rate. From experiments witnessed by the writer in depositing hard platinum by frictional precipitation, I am lead to believe that base metals can be used with this hard deposit of platinum upon them that will answer for many purposes equally as well as the solid metal. An experiment made in the presence of the writer was upon copper one ten thousandths of an inch in thickness. Part of the copper surface was previously polished, and the other part left unfinished. The deposit was applied in a few seconds, the polished surface retained a beautiful lustre, proving the advantage of this method for depositing upon diamond settings.

The unfinished portion of the copper was even brighter after the deposit of platinum than before. With the usual method of polishing a platinum surface the writer made no impression on the surface of the deposit in nearly a half an hour, on account of the intense hardness. This feature alone will give the method a great value besides the most economic method of coating other metals with platinum. Other experiments were made upon various metals, the thickness of the deposit was varied, heat was applied to nearly the melting temperature of the baser metals, and afterwards allowed to cool, and the metal with the platinum deposit was bent in various ways and distorted, but the deposit remained intact as though it was a part of the base metal itself. The various acid tests were applied and a reduction of the baser metals took place, showing the varying thickness of the deposit according to the time of manipulation, the separated platinum deposit remaining as a foil in the solution. Of all the many bath platinum plating solutions in present use there is scarcely one formula that can be called a success, and the waste is considerable, so this method should prove interesting to all users of platinum deposits from an economic standpoint.

This remarkable discovery is due to Arthur T. Firth, an electro-chemist and metallurgist of Auckland, New Zealand, the inventor of "Voltite"*, the plating powders, which are meeting with so remarkable a success, owing to the thousand and one uses that they can be adapted for. These consist of gold, silver, tin and other metals, but the most important of all is the deposit of platinum. Mr. Firth should feel highly honored by this latest discovery, which must prove to be of untold value from a commercial and economic standpoint to the world. Like all other Voltite deposits the platinum can be built to any thickness with remarkable rapidity. With the usual electro deposits heavy and dense deposits have proved a failure. Further information relative to the process will be given by Arthur T. Firth, The American Voltite Company, 225 West 39th street, New York City.

*Described in THE METAL INDUSTRY, July, 1911, and February, 1912.

NEW THREE HIGH ROD MILL

The cut, Fig. 2, shows a drive for a heavy three high rod mill. This drive is designed to be driven from a motor which is connected with a back shaft through a flexible coupling, the motor being mounted on a separate foundation, and not connected with the drive base plate except through the concrete. The gears are cut, the main pair being exposed and the back gears being enclosed in a suitable oil guard so that the gears can be run in oil, if desired, and so that dust and dirt can be kept away from them. The gears are very rugged for the service they have to perform, and the shafts and pillow blocks are also of ample size in order to keep the wear at a minimum and thus insure the alignment of the gears as much as possible. The pinion housing of the Three High Rod Mill is shown just behind the gear case.

These three high rod mills are made in several sizes, by the Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., and the cut, Fig. 1, shows one of them in connection with a coiler driven directly from the machine itself. This coiler is of the swinging type, and can be rotated around the post against the pinion housing so as to be out of the way of the work, should it be desired to roll straight. In these mills the center rolls are not adjustable, while the top and bottom rolls can be adjusted as occasion demands. The top roll is adjusted by the screws at the top of the housing, while the lower one is moved by turning the diagonal posts coming up outside the roll housings.

In operation the casting is usually lengthened out to 10 or 12 feet before the coiler is brought into play, and in this way it is not usual for the coiler to have to operate on rods over 11/16 inches in diameter. The necessity for coiling is one which depends on the practice of the mill itself, and varies in different localities according to the nature of the work and the facilities for the further reduction of the rods. As a rule the coiled stock after annealing is taken to a bull block and reduced further there. The advantage of the three high mill is that a rod can have two reductions at the same handling, without delaying the production for changing the adjustment of the rolls. The coiler drive is of advantage because the speed of the coiler rolls and the speed of the mill rolls can be accurately determined and kept at proper ratio. These mills are built in the varying sizes of 10, 15 and 18-inch diameter rolls, and the weight of the largest size is about 30 tons without drive. The drive without motor weighs about 35 tons additional.

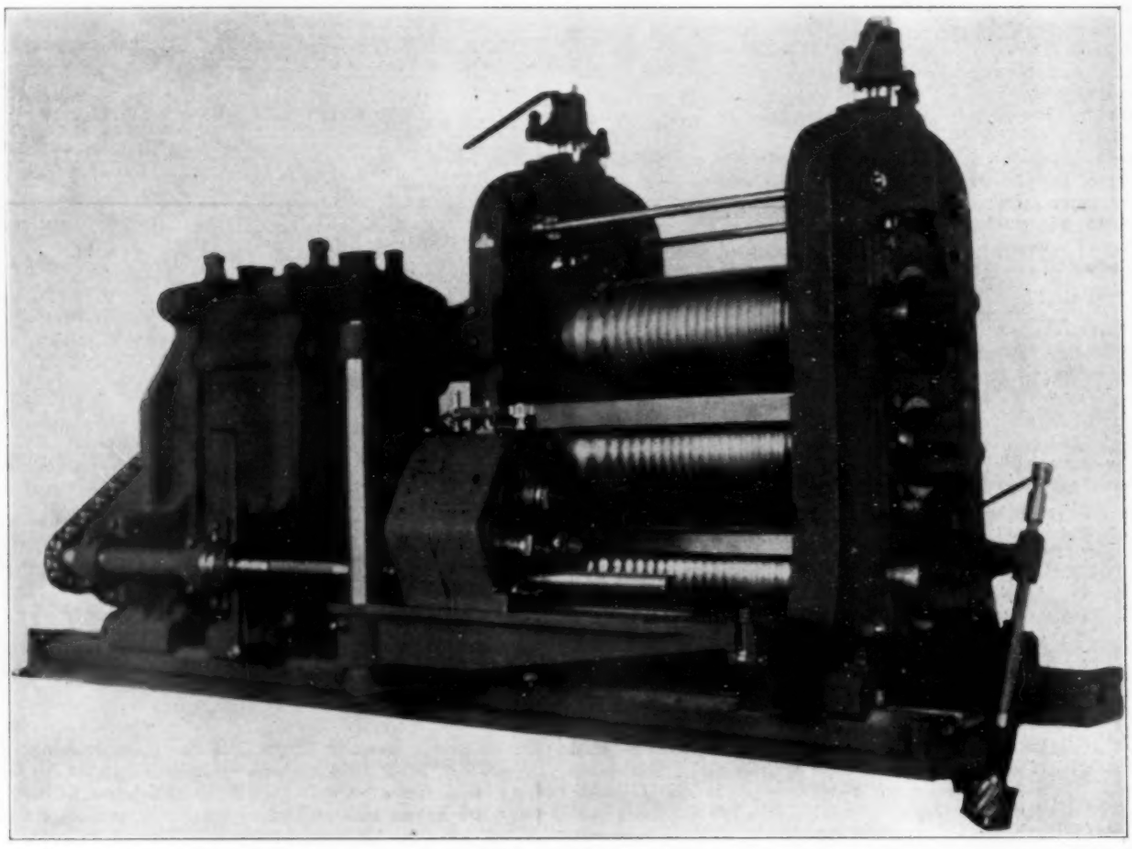


FIG. 1. THREE HIGH ROD MILL. MANUFACTURED BY THE FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

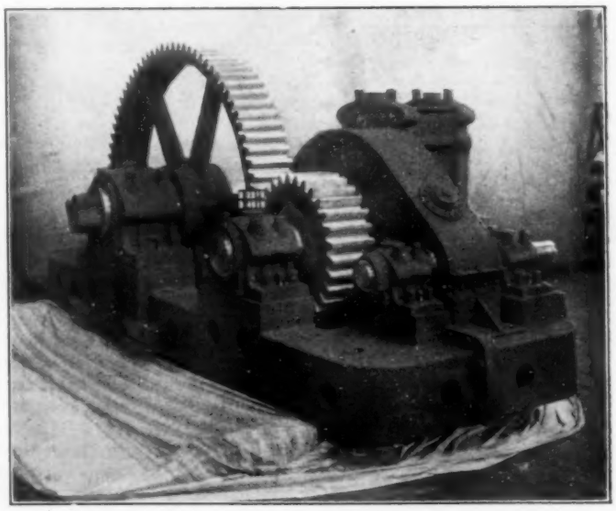


FIG. 2. DRIVE FOR THE THREE HIGH ROD MILL SHOWN ABOVE.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d street, on the fourth Friday of each month, 8 p. m.

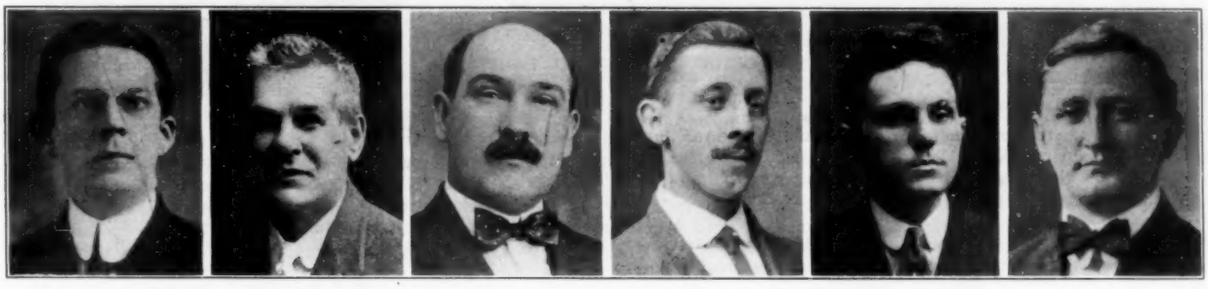
The May meeting of this association, held May 24, was an open one and proved very interesting. There were twenty-nine members and twenty-six visitors present. The installation of the new officers took place and the retiring president, Charles H. Proctor, was presented with a very handsome solid gold watch and chain on behalf of the members of the entire association, which he founded and has so ably guided during the three years since its birth. Four active and three associate members were elected, and a charter was granted to the Chicago branch.

Charles H. Proctor, who has recently been traveling around the country, spoke on "Lessons and Impressions from the West." George B. Hogaboom then gave a talk on why the manufacturers should support the association. Other addresses were made by President Richard H. Sliter and F. C. Clements, president of the Philadelphia branch.

An interesting meeting of the Philadelphia branch was held on May 31. Papers were read by M. Smith on "The Use of Vienna Lime in the Plating Room," and by S. M. Barr on "Voltmeters." A lengthy discussion on nickel solutions was also held.

The Rochester branch held an open meeting at Lintz's Hotel on May 28, which was well attended. The speaker of the evening was L. E. Sturdevant, of New York, who gave a talk on the benefits to be derived from membership in the association.

OFFICERS OF THE NATIONAL ELECTRO-PLATERS' ASSOCIATION 1912-1913.



RICHARD H. SLITER, President. CHAS. A. STIEHLE, First Vice-President. CLARENCE O. FIELD, Second Vice-President. ROYAL F. CLARK, Secretary-Treasurer. A. J. STREMEL, Recording Secretary. JOSEPH MINGES, Librarian.

LETTER OF APPRECIATION

TO THE FOREMEN OF PLATING & POLISHING DEPARTMENTS OF THE MIDDLE WEST:

I desire to take this opportunity to thank you for the many expressions of good will and the courtesies extended to me during my recent visit to the West as the representative head of the National Electro Platers' Association of the United States and Canada, and for the numerous invitations extended to me whereby I was enabled to visit some of your great manufacturing establishments and observe the progress you have made in the art of plating. Your plating departments were an agreeable surprise to me. I found them, in many instances, the most modern and up to date I ever had the pleasure of visiting during my years of connection with the plating industry. I realize that the manufacturing industry is developing to stupendous proportions in the Middle West, and the varied line of manufactures was an agreeable surprise to me. It proves that the seat of commercial industry is no longer in the East, but is rapidly moving westward.

From observations it appears to me that the city of Chicago in a few years will be the recognized great commercial center of distribution in the United States. This will be largely due to the economic advantage obtained in being near to the vast fields of raw material and the variety of manufactured articles now being produced. In the years past the acknowledged seat of learning of the plating industry was supposed to be in the East and the Eastern plater seemed to realize the importance of his knowledge. But constant change and evolution in various lines of industry sometimes changes the base of location. I have found in the great Middle West young men pre-eminent in the art of plating. Men who have not only made a study from the practical and commercial standpoint, but have preceded this knowledge with a thorough understanding of the chemical and electrical requirements of the art. Many of them have an intuitive mechanical knowledge, and they have been able to incorporate this knowledge in the development of their plating and polishing departments upon the most modern lines in labor-saving appliances and in sanitary conditions that have not only been beneficial to themselves but to their employers and employees. With the recent formation of the Chicago branch of the National Electro Platers' Association of the United States and Canada in Chicago, I can perceive a great future development in the knowledge of the art, that will not only be beneficial and instructive to you of the West, but perhaps through your efforts and co-operation will enable the art to reach the higher level to which of right it belongs.

CHARLES H. PROCTOR.
Past President of the National Electro-Platers' Association of the United States and Canada.

NEWARK INDUSTRIAL EXPOSITION

The industrial exposition held in this hustling New Jersey city met with far greater success than was anticipated and many of the concerns, whose support at first was lacking, were sorry before the end came that they had not taken action sooner. Already plans are being laid to hold such an exhibit every year.

This year there were in all 216 exhibitors, including about sixty jewelry and metal firms.

Complete lines of gold and platinum jewelry were shown by T. W. Adams & Company, Alling & Company, Allsopp & Allsopp, Durand & Company, Ehrlich & Sinnock, Gould & Eberhardt, Jones & Woodland, Link & Angell and the Richardson Manufacturing Company. Art metal goods, badges, bronze figures and metal novelties were exhibited by the American Button Company, American Art Metal Company, Art Metal Works, A. & F. Brown Company, William Bal, Inc., Cuspidore Manufacturing Company, A. Griffoul & Brother, Headley & Farmer Company, G. W. Heath & Company, Frederick Koch Company, Newark Brass Works, Newark Tube & Metal Works, Riley-Klotz Manufacturing Company, Wm. Snell, the Sara A. Fawcett Drawing School, Westinghouse Electric & Manufacturing Company, Whitehead & Hoag Company. Exhibits were also made by the following jewelers', metal workers', platers', polishers' and silversmiths' supply firms: American Oil & Supply Company, Crane Company, Crocker-Wheeler Company, Wm. Dixon, Inc., Dixon & Rippel, Driver-Harris Company, who had on exhibition a set of very ingenious pin making machinery. These machines made an incredible number of pins per minute, in fact they made so many pins that one wonders how the demands for pins can keep pace with the supply; Essex Foundry, General Electric Company, H. W. Johns-Manville Company, Kleno-Polio Company, Newark Brass Plate Engraving Company, Newark Electrical Supply Company, Newark Gear Cutting Machine Company, National Oil & Supply Company, Turner Machine Company, Newark Second-Hand Machinery Company, Webb Manufacturing Company, and Zeb & Hahnemann Company.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, H. R. Atwater, Cleveland, Ohio; Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.; Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburgh, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held at Buffalo, N. Y., September 23-27, 1912.

Secretary Hoyt reports that the Broadway Exposition Building, in which the exhibit of the Foundry and Machine Exhibition Company will be held in Buffalo during the week of September 23, is nearly completed. Before making a layout of the exhibit space the company desires to secure as much information as possible as to the needs of prospective exhibitors.

The exposition building is 176 by 267 feet, free from posts and columns, with a clear overhead room with the exception of a 14-foot balcony which runs clear around the outside wall; the headroom under said balcony is 10 feet. The floor is concrete, faced with wood, and sufficiently strong to support any reasonable weight. About midway on the west side of the building is a 16-foot building, and here it is proposed to build a temporary building. Thus the exhibit will be practically all one, and the general plan permits of a better grouping of exhibits and a more satisfactory layout than ever before.

ITEMS OF INTEREST TO THE INDIVIDUAL.

C. Powell Karr, formerly metallurgist for the Nathan Manufacturing Company of New York, has accepted a position as metallurgist for the Standard Chemical Company, miners of uranium and vanadium ores, Pittsburgh, Pa.

W. S. Landis, associate professor of metallurgy, Lehigh University, and assistant secretary of the American Electrochemical Society, has resigned and taken the position of technologist to the American Cyanamid Company, of New York.

Hugh Baxter, formerly foreman plater for the Jenkins Manufacturing Company, of Bloomfield, N. J., has taken a similar position with the J. K. Osborne Manufacturing Company, Harrison, N. J.

H. J. Ter Doest, the late foreman plater of the Forsythe Manufacturing Company, Buffalo, N. Y., has accepted a similar position with the Enterprise Manufacturing Company of Akron, Ohio.

A. Jobborn, former representative of the Precision Die Casting Company, through the West, has joined the selling forces of the Enterprise Metal Company, manufacturers of babbitt metals, solder, white metal alloys, etc., Syracuse, N. Y., and is now representing that concern between Buffalo and Detroit. Wesley McIntyre is representing the same company through eastern New York and New England.

Henry M. Lane, one of the editors of Castings and Wood Craft, has tended his resignation and will in the future devote his entire time to expert consulting in foundry work. This move was made necessary owing to the great demand on Mr. Lane's services for professional assistance along engineering and metallurgical lines. He has opened offices for this work at 301 Caxton building, Cleveland, Ohio.

Emanuel Blassett, Jr., who is well known throughout plating circles, and as a contributor to the columns of THE METAL INDUSTRY, has taken charge of the plating plant of the Burlington Mirror & Plating Company, Burlington, Vt.

John F. Fleckenstein has taken charge of the plating department of the Consolidated Chandelier Company, 132 W. 14th street, New York.

DEATHS

HORACE J. STEVENS

HORACE J. STEVENS.

Horace J. Stevens, the subject of this sketch, was born at Conewango, N. Y., January 5, 1866, and was educated in the common schools and academy, after which he became a country schoolmaster. In 1882 he entered the employ of the Beaufort Mine in Michigan, as carpenter, fireman, engineer, miner and several other jobs. Two years later he became a reporter for the Marquette Mining Journal, where he stayed for five years, during which time he married. Mr. Stevens then became manager and owner of the Peninsular News Bureau, Ishpeming and Houghton, Mich.

From 1901 up to the time of his death on April 22, as reported in the May issue of THE METAL INDUSTRY, he has been editor and publisher of the Copper Handbook, an annual devoted to the copper interests of the world.

GEORGE H. CLOWES

GEORGE H. CLOWES.

George H. Clowes, who, up to a few years ago was one of the best known of Waterbury's brass manufacturers died at his home in that city on May 17. Mr. Clowes was born in Clinton, Oneida county, New York, June 17, 1842, and his early boyhood was spent on Long Island, where he attended the Hempstead Seminary and the Jamaica Academy. From there, at the age of eleven, he went to Thetford Academy in Vermont, where he remained for four years. His education was finished at St. Lawrence University, Appleton, Wis., and he then returned East and made his home with his mother in Brooklyn until 1875.

At the outbreak of the Civil War, when Mr. Clowes was a young man of nineteen, he passed a successful examination before the Board of United States Examining Officers and was appointed adjutant of the McClellan Infantry, but through political favoritism he was prevented from going to the war with his regiment. He later enlisted in the 47th regiment of Brooklyn and went to the front as a private, but soon was appointed sergeant-major of the regiment, and this rank he held until mustered out at the expiration of his term of service. His next experience in the service of his country was on board the gunboat Flambeau, as paymaster and clerk, from which he was transferred to the storeship Home, where he remained until discharged in 1864.

In the fall of that year Mr. Clowes entered mercantile life as a bookkeeper for Garden & Company, New York. During the succeeding years he held various positions of responsibility and trust, generally connected with the financial end of large trust companies until in 1875 we find him as bookkeeper for Brown & Brothers, the large copper and brass manufacturers of Waterbury, Conn. In 1886, Brown & Brothers having become involved in financial difficulties, Mr. Clowes, together with Edward F. Randolph, a prominent business man of New York, formed the firm of Randolph & Clowes. This firm continued in business until August, 1899, during which time Mr. Clowes' wonderful business acumen and sagacity had placed his firm at the head of the seamless drawn brass and copper tube industry. Starting business with a capital of one hundred thousand dollars, and giving employment to fifty workmen and one clerk, within three years the business had outgrown its quarters and the yearly transactions amounted to more than six hundred thousand dollars. From this time on the growth of the concern was wonderfully rapid, and the plant was increased until it covered an area of six acres and employed five hundred or more workmen, mostly skilled hands. A large clerical force was also employed in the office at Waterbury and branches were maintained in New York, Chicago and Boston with suitable staffs.

In the management and development of this enormous industry Mr. Clowes had no aid from any source except the financial backing of his partner, who, however, gave no time to its conduct, policy or supervision. Mr. Randolph died in December, 1898, necessitating a change in the affairs of the company as his heirs did not desire to continue in the brass and copper business, so after passing through a period of litigation Mr. Clowes finally in 1900 retired from the active management of the concern, which was then known by the title of The Randolph-Clowes Company.

After his retirement from the active life of a brass and copper manufacturer, Mr. Clowes did not settle down to a life of ease as might be expected of a successful business man, but with his indomitable pluck he turned his attention to his real estate interests, which at this time were very large. He had in 1896 completed a palatial residence on the outskirts of the city of Waterbury, which he named "Norwood," where he had spent many years and thousands of dollars in developing that section of the city. At the present time, what was once considered to be waste land, has been developed into Waterbury's most valuable and desirable residence section. The vast estate was divided by Mr. Clowes into three sections, which he named respectively, Norwood, The Pines and Overlook, and these properties have been developed with marvelous foresight as regards residences and parks. In fact, so wonderful has been the growth of this section of the city that a former resident of Waterbury, returning after a lapse of years, would be completely bewildered by the forest of beautiful residences and picturesque home sites, which have been built and laid out by the founder. Mr. Clowes needs no better monument to his business ability and unquenchable ambition than to point to these residence sections of Waterbury on which he spent so many years to make conform to his ideas. Mr. Clowes leaves a widow, a son and a daughter.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

JUNE 3, 1912.

The month of May was a very satisfactory one for those interested in the several lines of metal industry and up to the present time the volume of business for the year is slightly in excess of what it was a year ago. Some lines are considerably better than in 1911, especially in bronze castings, while manufacturing jewelry business has shown a very healthy improvement during the past month.

The Gorham Manufacturing Company has recently shipped, from its bronze foundry at its Elmwood plant, two handsome, large bronze statues, which are to be placed in front of the Public Library building at Boston. These were cast at the works some weeks ago and have just been finished. They are among the finest examples of the bronze art that have ever been delivered by the company. The bronze department of the company is busy with an unusual number of large and notable contracts on hand. Several large statues are ready for shipment and others are in process. In its silversmithing departments the company is also being driven to an unusual extent. It has on hand numerous large contracts and during the past week it secured through Millard F. Davis, of Wilmington, Del., the contract for the silverware for the new Du Pont Hotel in that city, calling for approximately $10,000. There are to be 7,272 different articles, all uniform in design and finished in French gray and all suitably marked. The Gorham has also been awarded the contract to supply the new Hotel Baltimore, New York, with 18,000 pieces of silverware. This is one of the largest orders ever recorded and calls for special designs, so that table settings may conform to the general scheme of decoration.

A fire broke out in the stock room of the John R. Thomas Jewelry Company on the fifth floor of the old Calender building just after the noon hour early in the month. The greater part of the damage was occasioned by water that flowed down on to the

lower floors. There was considerable excitement, however, over the fact that three girls and Bernard Peterson, the latter a member of the firm of Peterson & Company, which occupied the quarters next to the Thomas shop, escaped by the fire escape. Benjamin P. Lippi, formerly of Waltham, Mass., has equipped a brass foundry on Allan street, Woonsocket, where he is prepared to do all kinds of brass and bronze castings. The business will be known as the City Brass Foundry.

In the death of John Nelson, at the State Hospital for the Insane, has been removed one of the most notorious "fences" that has ever menaced the manufacturing jewelry industry of New England. For more than a quarter of a century he has been under suspicion and several times arrested. There have been a number of convictions by juries, upon the facts of the case, but he always succeeded in escaping through technicalities. He was arrested in July, 1908, in connection with the stealing of a lot of gold scrap from Fontneau & Cook, of Attleboro, but appealed from a sentence of three months imposed by the Sixth District Court. He was finally convicted, but his family called for a commission in insanity and he was committed to the hospital where he died of progressive paresis.

The East Side Architectural Works, formerly located at 50 Charles street, has removed to 418 South Main street. Fire which started from some unknown cause in the quarters of the Harvard Jewelry Company on the fifth floor of the Fitz Gerald building, on Eddy street recently, did damage estimated at fully $5,000. This was caused not so much by fire as by water, the automatic sprinkler in the shop being started and water filtering down through the floorings to the ground floor, the establishments of Hutchinson & Heutis, Fowler Brothers, the W. J. Feeley Company and S. K. Grover being damaged

The City Welding Company, at Pawtucket, is being carried on by Frank X. Roberts, Omer H. Roberts, Ernest P. Roberts and Hermenegilde Plante. The sheet metal work on the new Hall & Lyon block, corner of Mathewson and Weybosset streets, is being done by the American Cornice Works of this city. The nickel and electro-plating works of Carl Erickson, in the Old Slatter Mill building at Pawtucket, was damaged about $500 by fire and water on May 4, with no insurance. This is the second visitation by fire experienced by the tenants of the building within a fortnight. The Providence Autogenous Welding & Manufacturing Company has commenced the erection of a one-story frame storage building at 291 Promenade street.—W. H. M.

NEWARK, N. J.

JUNE 3, 1912.

All lines of trade are quiet, the manufacturing jewelry, silversmith, the metal lines, foundries, platers, etc. There does not seem to be very much activity and little buying on the part of the dealer or the public. In jewelry the demand is either for 10 karat or platinum goods, the cheap and the high priced. The medium and what was known a year ago as the best, 14 to 18 karat, are practically not in demand now. There are not many gold plated goods made here. The metal novelties of bronze, brass, aluminum and composition are selling quite well, as also are the gold plated. Silver goods, sterling and German silver are in demand. The jewelry shops are working on short time, with smaller forces, and generally close up Saturdays. Some are busy, however, selling to the jobbing trade. The brush trade, chemical lines and general supplies are doing a fair business.

The Miller Scale Company has been in existence here for two years, and conducted by Albert Miller for seven years, have moved to 473 Washington street. A few months ago Joseph F. Curry was elected president and treasurer; Al Miller, secretary, and H. H. Picking, director. The capital stock is $50,000, $3,000 of it paid in. These scales sold all through the East and the South, are made of steel and brass, having high class jewel bearings. They formerly sold to the retail trade, but now only to the jobbing trade. Mr. Miller will act as salesman. The Keystone Pen Company, of Arlington, N. J., make 14 karat gold pens, and have new shapes out. The prices have gone down on these, owing to the larger demand. The points are made of hard Russian iridium, while before they used iridium with a platinum alloy. They have 65 hands working; business is good now, the only dull months being July and August. The Bayonne Casting company made a 16-foot diameter propeller of monel metal, with four blades, having a combined height of 16,000 pounds.

Boyajian Bros., 508 Shippen street, West Hoboken, started three years ago making oriental jewelry. All their product is strictly hand made, no machinery being used, even the polishing and buffing is done by hand. The gold they use is 22 karat, and solid silver .999 per cent. pure. Charles C. Wientge & Co., who make a line of 14-karat gold goods, are also making a new line of hollow silverware.

L. R. Douglass, manufacturer of jewelry, at Atlantic City, has enlarged his business.

The K. Bracher, Jr., Manufacturing Company, of Belleville, are making agate bearings and pinions for jewelers' scales, and do a large business in making oil stones for the trade, of any design, shape or size. They have their own quarry at Hot Springs, Ark.

Joseph F. Curry has been doing very well since starting a few months ago at 475 Washington street, in making automobile and carriage parts, and conducting a general plating business. He has a well equipped plant, and is well known to the trade, having been in business for years on Mulberry street as the J. F. Curry Manufacturing Company.—H. S.

ATTLEBORO, MASS.

JUNE 3, 1912.

All things considered, conditions in the jewelry trade are generally satisfactory, though more buying enthusiasm might be wished. The trade conditions throughout the country seem to be improving steadily and it is inevitable that the jewelers will share in the revival. The buyers are making their invasion of the East as June opens and their optimism is up to the mark expected.

On Sunday, June 2, Edward C. Martin and Albert A. Bushee died. Both are widely known. The new Whiting factory in Plainville is expected to be completed within a few weeks. William Chapman, night watchman at the D. E. Makepeace Company, pleaded guilty to the larceny of $200 gold stock and the case was continued for sentence. The past year has seen an unusual number of cases in which larceny from factories was alleged.

Madalian & Hawkins have taken the space vacated by Maintien Bros. & Elliot in the Manufacturers' building in order to enlarge. An addition has been completed for the Horton & Angell Company. The J. N. Waine Company, capital $5,000, has been incorporated and has located in North Attleboro. It will manufacture swivels, spring rings and special findings. James B. Waine, George Prew, John Thompson and Byron Remington are the incorporators. E. H. Cummings, Frederic Sturdy and H. K. Sturdy have incorporated the Sturdy-Cummings Company, capital $40,000, for the purpose of dealing in jewelry.—C. W. D.

PHILADELPHIA, PA.

JUNE 3, 1912.

Business on the whole does not seem to be up to the normal this year. Most all lines have been complaining of the lack of interest and the inactivity among manufacturers, jobbers and retailers. There is some business being done, but conditions are not as they ought to be. Collections are slow and the buying has been deferred by many. Long time credits are asked for and given by some, so a firm has to have a big capital to carry on such a credit business. Others have to follow in order to do business. Some lines are asking for a year's time to pay, which is a big item if all their business is done on the same basis. Walnut street is being developed as one of the city's principal business thoroughfares, and the jewelry trade particularly is showing up strong on this street. There are ten jewelers on that street.

G. William Reisner, of Lancaster, made prizes and pins for the Mercersburg (Pa.) Academy; High School of Beloit, Wis.; Potomac University, Washington, D. C.; Winona (Minn.) Seminary; Cornell University, and a number of other schools.

Miller & Herdan, manufacturing jewelers of 721 Sansom street, dissolved partnership, William Miller continuing the business. The Arts and Crafts Guild of 237 South Eleventh street, have had a good display of jewelry and brass and copper work, made here. The American Cuckoo Clock Company will move

their offices to the new plant, 1665 Ruffner street. Heeren Bros. & Company, of Pittsburgh, received some large orders, which have kept this firm busy manufacturing jewelry for months.

John Meadons, silversmith, has leased the second floor at 214 South Twelfth street, for factory purposes. S. Lieberman and W. Estis, for years manufacturing jewelers and watchmakers at 709 Sansom street, have dissolved partnership. Mr. Estis continues at the old address as a watchmaker, and Mr. Lieberman continues making jewelry at 722 Sansom street.

Eugene Richter, who was for years engaged in the silver plating business at Lancaster, Pa., recently departed this life.

A. J. Wallace, who has for years been with Matthew Addy & Co., has associated himself with the selling force of E. J. Lavino & Co., ore and metal merchants of the Bullitt building. George C. Sturgis would head the concern. The Nelson Valve Company have had a night force working and report a gradual gain in business.

The H. U. Lewis Company, of 30 Church street, New York City, have opened an office at 837 Real Estate Trust building, in charge of S. A. Stephens. They will sell the lathes, drills and presses of Prentice Bros. Company, of Worcester, Mass., also the milling machinery made by the Kemp-Smith Manufacturing Company of Milwaukee, and the Newark (N. J.) Gear Cutting Machinery Company's gear cutters and shapers.

The Pittsburgh Lamp, Brass & Glass Company, who were in the hands of the receiver, have been reorganized, and sufficient money has been raised to carry on the business. A good working capital has been secured, and banks holding loans for $490,000 have agreed to a three years' extension.

Hollinghead N. Taylor, a great grandson of one of the founders of N. & G. Taylor Co., tin plate manufacturers of this city, who were established in 1810, has been admitted to the business. H. R. Stacks and John Johnson, formerly with George V. Cresson Co., have formed a partnership as Stacks & Johnson, 842 Drexel building, and have engaged in business as engineers and sales agents for the Lehigh Crusher Company, Lehigh Clutch Company, and Catasaqua Castings Company, all of Catasaqua.—H. S.

ROME, N. Y.

JUNE 3, 1912.

Rome is fast becoming an industrial center and is now one of the largest copper and brass working places in the State. It has a population of 30,000 and is steadily growing.

Rome has been before the public eye more than ever in the past few years. Mention of the doings in the "Eternal City" have been made in papers far and near. A good share of her awakening is due to the newly organized "Chamber of Commerce." This is composed of the business men and the heads of the leading industries in the city. While it is a little early to tell just how much this new organization is going to benefit the city, yet many important strides have already been made. Chief among these is freight service.

The shipping of goods concerns everybody and anything which is done to improve it is a real asset to any city. The New York Central R. R. Co. have promised Rome a much needed freight house, while the Ontario & Western Ry. is already planning one. The Barge Canal is going just a little south of the city, and when this is completed Rome's shipping facilities will be almost unequaled, as the plans show a large harbor here. The railroad officials are working with the Chamber and it is believed that big results will be accomplished toward the shipping of Rome's millions of pounds of copper and brass and other goods.

The Rome Brass and Copper Company are the largest producers here of brass, copper, German silver and silver in sheets, wire, rods, tubes, plates and various novelties in these metals made from the blanks and shells. They have from 300 to 400 hands working; they have been very busy, but are getting caught up with the orders.

The Rome Hollow Wire & Tube Company make hollow wire for incandescent lighting and radiator tubing. They make as small as a 64th of an inch up to one inch wire of copper and brass. Prices are good; they are busy and business generally has been better.

The Rome Metallic Bed Company say that business is good, turning out 700 brass and iron beds a day, but the capacity of the plant is 1,000 beds a day. The product is divided about equally between brass and iron as to dollars and cents. A new eight-story and basement concrete building has been taken at 416 West Twenty-fifth street for the wholesale distributing of their lines for New York City. The business there is conducted as the Manhattan Bedding Company and the New York Couch Bed Company.

The Rome Electric Company, of Jay street, have been there only a year and is plactically a new plant. Have eighteen double heavy wire machines, which wind a double covering over the copper wire for insulating. All this mill does is to cover the wire, and are now covering a new kind of flat wire. Have five machines for covering medium sized wire and have thirteen fine wire machines. The latter wind fine silk around the wire, each machine has twenty spindles and a girl can operate eighty spindles alone. Have own electric power plant, the only one of its kind here; have 80-horsepower gas engine and generator and Sturtevant heating plant.

CLEVELAND, OHIO

JUNE 3, 1912.

There seems to be no diminution of business with the Cleveland firms engaged in the metal industry. Reports from the different factories and plants around Cleveland indicate that they are busy turning out orders for all kinds of metal goods. The automobile factories particularly are busy at this time of the year. The demand for the lower priced cars which has been met by the furnishing of vehicles costing from $700 to $800 and up, has caught the public taste so that the year 1912 promises to see a larger number of automobiles manufactured and sold than ever before in the history of the United States. As a result not only the local automobile factories, but those firms furnishing automobile parts find that there is a strong demand for metal goods and plated work. In the city of Cleveland building records of previous years are being ruthlessly smashed, and it is believed that the same thing will be shown elsewhere throughout the country. As a result the hardware manufacturing concerns turning out brass and copper specialties of all kinds are finding business exceedingly good. The same is true of the plumbing concerns, of which there are a large number in this city. Gas and electric fixture plants, of which there are several, have never been so busy as at present. Altogether the present outlook for the metal men in Cleveland is exceedingly satisfactory.

During the past month the Continental Jewelry Company sustained a misfortune, when the building occupied by it on upper Euclid avenue was severely damaged by fire. The stock of jewelry in the making was almost ruined, and considerable loss was sustained by the company.—S. L. McM.

DETROIT, MICH.

JUNE 3, 1912.

The brass and aluminum business in this city and, in fact throughout the State, has been unusually good during the last four weeks. Conditions are practically the same as one month ago, with the exception that everything in this line has a steadier look for continued advancement. It is apparent that this year will go down in the history of Detroit as the best it has ever experienced. Every line of the aluminum trade is at a high water mark. Not only the automobile manufacturers; that is the brass and aluminum end, but other lines, such as plumbers' supplies and lubricators shows no let-up for the season. Every Detroit newspaper carries advertisements for more help in these factories. So great has become the demand for help that men from other plants who may be in anyway worked into the business are taken on, and this causes an unusual dearth of workmen for this season of the year.

The Chamber of Commerce is vigorously at work to correct, before the year is over, the transportation handicap that has so fiercely beset Detroit concerns. The Cadillac Automobile Company is so sorely perplexed that threats are made by its management to seek relief in some other city. The Michigan Central Railroad has agreed to make many extensions, but the real fault lies in the lack of terminals. These must be built by every steam line entering the city before the situation is corrected; and this, of course, requires time. Everyone, however, is hoping for the best and that perplexed manufacturers will be patient until the difficulty is straightened out.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The Defiance Manufacturing Company, Railroad and Wayne avenues, Philadelphia, Pa., are installing a plating plant.

It is reported that H. A. Danna, of Clarksburg, W. Va., is organizing a company and building a plant for the manufacture of aluminum.

The Lumen Bearing Company, Brass founders, Buffalo, N. Y., have filed building plans for an addition to their foundry, to be used for all kinds of brass work.

The Pilling Brass Company, manufacturers of brass, German silver and copper, Waterbury, Conn., are going to erect a one-story brick building, 50 by 110 feet.

Charles H. Besly & Company, manufacturers of brass goods, Beloit, Wis., are planning the erection of a three-story concrete addition to their plant, 260 by 70 feet.

It is reported that the Turner & Seymour Manufacturing Company, manufacturers of brass goods, of Torrington, Conn., will erect a two-story addition to their plant, 42 by 64 feet.

The current trade press reports that the Gaynor-Mitchell Company, manufacturers of brass novelties, Bridgeport, Conn., have awarded the contract for the construction of a new plant, 60 by 146 feet.

The Antiseptol Liquid Soap Company, manufacturers of "Antiseptol" liquid soap, Chicago, report, that owing to the great increase in their business, they have leased larger quarters at 564 West Randolph street.

The report that Whipple & Choate, manufacturers of metals, Bridgeport, Conn., are having plans prepared for the construction of a new foundry, is somewhat premature as nothing has been definitely decided as yet.

The Willys-Overland Company, manufacturers of automobiles and automobile parts, Toledo, Ohio, it is stated, have awarded contracts for the erection of a three-story concrete building, 92 by 162 feet and two one-story buildings.

The G. E. Hoglund Foundry Company, manufacturers of brass and iron castings of all sizes and descriptions, Gardner, Mass., are now established in their new factory which has a capacity of 12 tons per day. The building is 60 by 108 feet.

Zahniser Bros. & Sten, Washington, Pa., report that their new brass foundry has just been completed, and they are now running full time in all departments. Their new plant replaces the one which was destroyed by fire several months ago.

The Bardons & Oliver Company, builders of lathes, screw machines, etc., Cleveland, Ohio, are reported to be considering the erection of a $90,000 addition to their plant. Considerable machine shop equipment will be purchased in the near future.

Fred Schenll & Son, 1453 Niagara street, Buffalo, N. Y., announce that their new foundry, equipped with the best of everything, is now running. Castings of bronze, brass, aluminum, phosphor bronze and manganese bronze are being manufactured.

It is stated that The G. E. Prentice Manufacturing Company, manufacturers of sheet metal and wire goods, New Britain, Conn., with a factory at Berlin, will probably in the near future be in the market for power, drop and foot presses, and tumbling barrels.

Monel metal is now being used by some manufacturers of dairy machinery for those parts subject to corrosion; experiments having shown the chemical resistance of this metal and also its particular suitability for making pails, pans, ice cream freezers and the like.

It is reported that a new company, to be known as the Southern Steel & Iron Works, is to be formed at Jacksonville, Fla., to manufacture steel, iron, bronze and aluminum castings. The company, which is to have a capital of $250,000, will absorb the Jacksonville Iron Works.

The Standard Brass & Copper Tube Company, manufacturers of seamless drawn brass and copper tubes, New London, Conn., report through R. S. Stringer, treasurer, that they are planning to double their present output by the erection of additional buildings and installation of the necessary machinery.

A. Allan & Son, 492 Greenwich street, New York, advise us that they will soon be ready to place orders for a complete installation of brass foundry equipment, including an industrial railway, melting furnaces, core ovens, etc. They desire to receive catalogs from manufactures of all kinds of brass foundry equipment.

The annual report of The International Nickel Company for the year ended March 3, 1912, shows a total income for the past year of $5,088,966, which was slightly less than for the preceding year. The surplus for the year was $903,799. The profit and loss surplus on April 1, 1912, amounted to $3,938,093.

The New Era Lustre Company, manufacturers of lacquers for every purpose, New Haven, Conn., announce through F. S. Cobb, secretary and treasurer, that they have an exhibit at the New Haven Board of Trade, of raw materials used in the manufacture of lacquers, also finished products in spraying enamels, showing the wide range of possibilities of these enamels.

The Mebane Manufacturing Company, manufacturers of "bohnite," a case hardening material; and "homogen," a brass flux, have moved into their new plant with all new equipment. The company are now able to take care of their rapidly increasing business to better advantage, as their capacity is ten times greater than at the old plant.

John T. Lewis & Bros. Company, Philadelphia, Pa., report, through S. F. Reeves, purchasing agent, that they have awarded the contract for the erection of a one-story manufacturing building, 185 by 265 feet, with a three-story wing 60 by 120 feet. The company are still considering the purchase of necessary equipment for the melting and casting of pig lead.

The Westminster Metal & Foundry Company, W. H. Moore and Fred D. Miller, proprietors, have removed to Waynesboro, Pa., where they are now located in their new plant, which is thoroughly modern in every respect. Most of the machinery has been installed and eight men are now working in the foundry. It is expected to increase this number to thirty in the near future.

The Rochester Brass & Wire Works Company, Rochester, N. Y., notice of whose incorporation was published in the May issue of THE METAL INDUSTRY, is the outgrowth of a firm, and are engaged in jobbing and retailing brass and copper wire and fencing. The officers of the company are: President, G. E. Van Laer; secretary and treasurer, G. R. Helmer; manager, J. Collins.

Among recent installations of plants which have been made by the S. A. Day Manufacturing Company, manufacturers of platers' and polishers' supplies, Buffalo, N. Y., are plating plants for the

Fedders Manufacturing Works of Buffalo and the Laudon Manufacturing Works of Fort Erie, N. Y.; and a polishing and plating plant for the Niagara Searchlight Company, Niagara Falls, N. Y.

James C. Doran & Sons, manufacturers of jewelry, Providence, R. I., have awarded the contract for the erection of a nine-story L-shaped factory building of reinforced concrete construction, which will contain about 13,000 square feet of floor space on each floor. A gas producer plant of 200 k.w. will be installed to operate in connection with the present steam-electric plant of 300 k.w.

The Rockwell Furnace Company, complete furnace equipment, New York, report that they have recently completed for the Heppenstall Forge & Knife Company of Pittsburgh, Pa., and Bridgeport, Conn., three overfired type accurate temperature furnaces for the heat treatment of steel forgings, etc., the largest furnace having a heating chamber four feet wide by fifty feet long. The fuel used is oil.

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., report, through W. E. Fulton, president, that they are considering the building of an addition to their plant. At first the new building will be used as a storage room for finished machinery, and will afford new floor space so that they can at any time add new tools to take care of increased business. They report business as fairly good.

The Watson-Stillman Company, 196 Fulton street, New York, announce that they will shortly open a branch office at Philadelphia, and are increasing their shop facilities to meet the demands of their business. The following officers were elected at the May meeting of the directors: President, E. A. Stillman; vice-president and secretary, A. F. Stillman; treasurer, J. P. Bird; chief engineer, Carl Wigtil; superintendent, Frank Lary.

The National Plating & Manufacturing Company, Louisville, Ky., report, through W. E. Neighbors, that they are installing a first-class plating plant and will be prepared to do brass, copper, nickel, gold and silver plating; in addition to manufacturing metal spinnings, chandeliers and lighting fixtures. The officers of the firm are: President, William Mooser; vice-president and secretary, William Neighbors; treasurer, Louis Hoeck.

The M. H. Foundry & Manufacturing Company has recently been formed at Belleville, Illinois, to manufacture plumbing goods and drinking fountains. The vice-president and general manager of the company is Joseph Heeney, while Peter Thinnes, a man of wide experience in brass and aluminum foundry work, will act as superintendent. The complete equipment for the plant of tools, patterns, machinery and air chucks was furnished by the Hannifan Manufacturing Company of Chicago.

The annual exhibit of the work of day students of Pratt Institute will be held at the Institute June 15, 17 and 18. This exhibit is open to the public and affords those who are interested in industrial and technical education an opportunity not only of inspecting the work of the students in the various courses, but also of inspecting the methods and equipment of the school. The Institute offers day and evening courses for both men and women in a great variety of vocational subjects.

At the New England Foundrymen's Association in Hartford, Conn., May 8, a committee, consisting of B. M. Shaw, of the Walker-Pratt Company; G. P. Aborn, of the Blake & Knowles Steam Pump Company, and H. A. Carpenter, of Providence, R. I., to look into better fire protection and insurance rates for foundry properties. In addition to securing an adjustment of fire rates, the committee will make a study of conditions with a view of reducing destruction of property by fire.

The Quigley Furnace & Foundry Company has been organized by W. S. Quigley, formerly vice-president and general manager of the Rockwell Furnace Company, New York City. The new company has offices at 50 Church street and is equipped to engage in the construction of furnaces for all industrial requirements with special reference to large instalments for annealing, heating, forging and melting furnaces, soaking pits, core and mold drying ovens, open-hearth steel, malleable and gray iron melting, dross reducing, copper refining, etc.

The consulting metallurgical business conducted by E. F. Lake at Bayonne, N. J., has been merged with the metallurgical engineering firm of Nixon & Raab under the name of Lake, Nixon & Raab at 156 Fairview avenue, South Orange, N. J. Die-casting machinery alloys and processes will be specialized upon. All kinds of physical tests and chemical analyses will be given the various metal products. Advice will be given as to the best methods, and machinery or apparatus to use in melting, alloying, casting, forging, welding, galvanizing, coloring and plating or otherwise working and treating either ferrous or non-ferrous metals or alloys.

Plater and polishers will be interested to learn of a new concern organized last year for the manufacture of buffs, leather and wood polishing wheels and other platers', polishers' and buffers' supplies. This is The Platers' Manufacturing Company, who have been located at 418 West 27th street, New York, since October, 1911. The organizers of the company are Alfred B. Antisell and George P. Keller, both of whom have had long experience in the manufacture of platers' supplies. They report that their success has already exceeded their anticipations and that they are already outgrowing their manufacturing quarters and will be compelled before long to add additional space.

The General Aluminum & Brass Castings Company is a new concern which has been started in Detroit, Mich. They report, through F. C. Root, that they have broken ground for a modern brick and steel construction foundry, 120 by 200 feet, which will be completely equipped for the manufacture of aluminum and brass castings. In the construction of this plant the arrangements of departments and equipment have been made so that the lowest possible costs may be obtained. The plant has also been built so that it can readily be extended with the development of the industry. They expect to be ready to deliver castings in August. The officers of the company are: President, J. A. Rutherford; vice-president, F. C. Root; secretary, H. P. McIntosh, Jr.

The American Brass & Iron Company, brass founders, machinists and platers, Detroit, Mich., are now erecting a factory building, 41 by 153 feet, at Crystal and Trombly avenues. This building adjoins a recently completed brick foundry 37 by 82 feet. The factory will be of concrete construction, the walls and foundations being built with a strength sufficient to support two additional stories. The factory will be up-to-date in every respect, equipped with all conveniences for employees, including toilets, lockers, sanitary drinking fountains, etc. When this building is completed it will nearly triple the capacity of the company. This factory together with the foundry mentioned above gives the American Brass & Iron Company a plant second to none in Detroit in the matter of facilities and equipment for turning out brass work of all kinds.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., June 25, 1912, and publicly opened immediately thereafter, to furnish at the navy yard, Puget Sound, Wash., a quantity of naval supplies, as follows: Sch. 4615, brass bolts and nuts; Sch. 4614, brass, naval, rolled; brass, rod; brass, sheet, soft. At the Navy Yard, Brooklyn, N. Y., Sch. 4604, bronze drawer pulls; Sch. 4607, bronze, plates. Sch. 4614, brass gate valves. At the Navy Yard, Norfolk, Va., Sch. 4607, copper, bolt, round; solder, spelter, medium. The following bids will open July 2: At the Navy Yard Brooklyn, N. Y., Sch. 4627, acid muriatic; beeswax. Sch. 4631, hooks, brass, cabin door; screws, brass, machine; screws, brass, wood. At the Navy Yard, Philadelphia, Pa., Sch. 4626, aluminum, ingot. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office nearest each yard, or to the Bureau.

T. J. Cowie, Paymaster-General U. S. N.

The electrolytic Process Company, 225 West 39th street, New York, announce, through A. C. Dodge, manager, that they have been advised by counsel that their patents No. 1,003,187 of Sep-

tember 12, 1911, and No. 1,026,627 of May 14, 1912, for the "Leuchter Non-Corrosive Nickel Alloy Electrotypin g Process" for the production of electrotypes, embossed stamps, bookbinders' stamps, and the like, are broad and controlling, and that any individual, firm or corporation manufacturing, selling or using electrotypes containing nickel, iron or steel alloy, would be liable as an infringer of these patents, excepting those who have been authorized by this company as licensees, and which licensees are herein enumerated:

The United States Government Printing Office, Washington, D. C.; Joseph P. Felt & Company, 238 William street, New York City; P. F. Collier & Son, 416 West 13th street, New York City; Robert Gair Company, Washington street, Brooklyn; the Cresset Company, 338-340 Pearl street, New York City; Geo. S. Ferguson Company, 15 North Seventh street, Philadelphia; Geo. C. Scott & Sons, 180 Purchase street, Boston, Mass.; Standard Electrotype Company, Pittsburgh, Pa.; Van Bolt & Company, Columbus, Ohio; the United States Printing Company, Cincinnati, Ohio; the McDonald Press, Chicago, Ill.

They therefore beg to caution the trade against manufacturing such articles or handling the same if manufactured by others not duly licensed by this company as owner of the patents.

FIRES

Fire during the evening of May 8 totally destroyed one of the buildings constituting the brass plant of Joseph Buckley at Pittsfield, Mass. It was fortunate that this building contained nothing but the stock and tools used in the foundry. The loss was estimated at about $2,000. Mr. Buckley reports that he has rebuilt and is running as usual.

The factory of Silver & Company, 304-14 Hewes street, Brooklyn, N. Y., was seriously damaged by fire on the afternoon of May 7, causing a loss of $30,000, which was covered by insurance. The company reports, through G. W. Ferdon, that they have leased the four-story and basement building opposite from their factory and are again in operation. This concern has been manufacturing kitchen and household utensils for twenty-eight years at a stretch, this being their first interruption.

REMOVALS

A. Klipstein & Company, manufacturers of chemicals, are now located in their new building at 644 Greenwich street, New York.

The Thomas W. Pangborn Company, sand blast specialists, have removed their plant and general offices from Jersey City to Hagerstown, Md.

CHANGE OF FIRM

The Cincinnati Galvanizing Company, Cincinnati, Ohio, have purchased the entire business of The Utilities Supply Company, manufacturers of household specialties, of the same city.

The Baltimore Tube Company, Baltimore, Md., announces the absorption by it of the Tube Bending and Polishing Machine Company and the Compressed Copper Company. The Baltimore Tube Company assumes all of the liabilities of the old companies; likewise all of their assets accrue to this company. The capitalization of the present company is $1,200,000. The officers are: President, Herbert A. Wagner; vice-presidents, Norman James and Daniel C. Spruance; secretary-treasurer, John L. Bailey.

BUSINESS TROUBLES

Robert F. Tilney, referee in bankruptcy, reports that the Sterling Smelting Company, Brooklyn, N. Y., was duly adjudicated bankrupt on May 16.

On May 21, Referee Bertolet held an audit of the account of P. A. Horine, trustee in the bankrupt estate of Wayne J. Yerger, trading as the Hercules Brass Foundry, Reading, Pa. The fund amounts to about $1,400 and the debts will total about $9,000.

Carr, Beggs & Steinmetz, 1218 Chestnut street, Philadelphia, Pa., who represent the creditors of the Naulty Smelting & Refining Company of that city, state that a petition in bankruptcy is about to be filed against this firm. It is quite likely that the assets, if properly administered, will yield sufficient funds to pay the creditors in full.

INCREASE OF CAPITAL STOCK

The Bristol Brass Company, of Bristol, Conn., have voted to increase their capital stock from $600,000 to $800,000.

The Rome Hollow Wire & Tube Company, Rome, N. Y., have increased their capital stock from $50,000 to $100,000, and are planning on moving into the plant recently made vacant by the Rome Tube Company.

The Rome Sanitary Manufacturing Company, Rome, N. Y., manufacturers of plumbers' supplies, have increased their capital stock from $5,000 to $25,000. M. G. Merritt, formerly superintendent of the Rome Metallic Bedstead Company, will manage the company in the future.

The D-C Manufacturing Company, makers of supply and waste fittings and compression valves, Canton, Ohio, have increased their capital stock from $75,000 to $100,000, in order to enlarge their foundry, nickel-plating and finishing departments. The company report that business is very good and they are running double turns. The officers are: President, D. Charmois; vice-president, H. F. Ake; secretary-treasurer, J. J. Krider; advertising manager, G. P. Blackiston.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

The Belleville Copper Rolling Mills, Belleville, N. J. Capital stock, $50,000. Incorporators: H. W. Hendricks, E. J. Keane and G. A. Dorer, all of Belleville.

The National Aluminum & Bronze Manufacturing Company, Indianapolis, Ind. Capital, $10,000. To carry on a foundry and machine business. Directors: H. J. Weiler, H. Hunt and E. Davis, all of Indianapolis.

The Control Manufacturing Company, Albany, N. Y. Capital stock, $100,000. To manufacture metal castings. Incorporators: Wm. J. Kerwin, Edward T. Newcomb and Jos. P. Coughlin, all of Albany.

The McRae Brass Manufacturing Company, Detroit, Mich. Capital, $1,000. To take over the business heretofore conducted as a partnership under the name of McRae & Roberts. The company manufactures steam brass goods.

Branford Foundry Company, Branford, Conn. To carry on a general foundry business. Officers: President, Walter Y. Schall, New Haven, Conn.; vice-president, V. Osborne; sceretary and treasurer, J. J. Cunningham, both of Branford. Directors: The officers and George W. Hull, of New Haven.

PRINTED MATTER

Enameling Ovens: The American Enamel Company, Providence, R. I., issue a folder describing their "Mascot" enameling ovens, together with their line of enamels for all purposes.

Plumbing Brass Goods: The Haydenville Company, Haydenville, Mass., have issued an attractive little catalog in the interests of their "quick-ope" compression work. This line of high-grade sink, lavatory and bath-room faucets is fully described and illustrated in this catalog, copies of which will be sent upon application.

Recording Gauges: The Bristol Company, manufacturers of

Bristol's recording instruments, Waterbury, Conn., have just issued catalog No. 1000 on Bristol's Recording Gauges. This is a 64-page, 10½ by 8-inch catalog, and lists all of Bristol's recording pressure and vacuum gauges, except round form models 50, 52 and 56, which are listed in Bulletins 144 and 148.

Heat Treating Furnaces: The Rockwell Furnace Company, 26 Cortlandt street, New York City, have issued Bulletin No. 30, giving photographs and descriptions of their over-fired heat treating furnaces, for which accurate temperature with either gas or oil fuel is claimed. These furnaces are particularly adapted for annealing brass, copper, German silver, aluminum, etc.

Electro-plating Supplies: The Hanson & Van Winkle Company, dealers in electro-plating and polishing supplies, Newark, N. J., have issued a catalog and price list No. 20, for 1912. This book is a well-bound volume of 257 pages with index, bound in flexible board, and gives a most complete list and description of everything needed for the plating and polishing rooms. Copies will be forwarded upon request.

Mineral Cleaner: The Electric Smelting & Aluminum Company, Lockport, N. Y., describe their mineral cleaner for use of metals, cleaning grease and oil from the same, in a two-page folder just now being sent to the trade. It is claimed that this cleaner is entirely different from anything else on the market and, to anyone interested will be sent enough of the cleaner from which to make a half-gallon solution.

Trisalyt.: The Roessler & Hasslacher Chemical Company of New York, have issued the second edition of their little booklet on Trisalyt. It gives in detail the advantages claimed for Trisalyt, the new plating salt. There is also given directions for the preparation and maintenance of plating baths by the use of Trisalyt for copper, brass, bronze, zinc, gold and silver plating. Sample copies of this booklet may be had upon request.

Bearings: The Lumen Bearing Company, brass founders, Buffalo, N. Y., state in a new circular that Lumen bronze bearings are preferably used in air compressors, electric motors, machine tools, refrigerating machinery, rolling mill tables, traveling cranes, etc. They claim that their bronzes are equivalent in strength, wearing and anti-frictional qualities, to the best phosphor bronze, and that their use will save the consumer about 40 per cent.

Melting Furnaces: A handsome catalog has just been issued by the Monarch Engineering and Manufacturing Company of Baltimore, Md., in the interests of their metal melting furnaces. In this catalog the Monarch "Steele-Harvey" crucible, tilting, non-tilting, stationary and portable furnaces, together with the high and low pressure fuel oil burners are completely illustrated and described. A feature of the catalog is a description of the Monarch soft-metal melting furnaces and Monarch Acme core ovens. Sample copies upon request.

Ball Bearings: An interesting and valuable contribution to the ball bearing literature of the present year is the engineering edition of catalog treatise, issued by The New Departure Manufacturing Company, of Bristol, Conn. This book is fresh from the press and contains seventy-six pages. It has been prepared by the company's staff of ball bearing specialties and engineers. It gives valuable information of a technical character, and is fully illustrated by fine engravings. The company offer to send this catalog on request to manufacturers, purchasing agents, designing and mechanical engineers, and other responsible persons who are interested.

ADNEWS

On another page will be found the card of Hermann Schaffer, 4901 Sixth avenue, Brooklyn, N. Y., who makes a specialty of modeling for silver, brass and bronze ecclesiastical and memorial work. Mr. Schaffer is also a designer.

The Harral Soap Company, 467 Greenwich street, New York, advertise their "Kleeneasy," which is used in the leading typewriter and other large factories for removing Vienna lime; also their vegetable oil soap for metal spinners, drawers, etc.

Rockhill & Victor, 114 John street, New York, report the sale of a large number of the "Nonesuch" carboy rockers both in the United States, Canada and abroad. One of their recent shipments was to an English branch of the Edison Company near London.

The George Zucker Company, 202-208 Emmett street, Newark, N. J., begin in this issue to advertise their well-known buffing compositions. Their "Acme brand" white finish is famous all over the world wherever metal goods are made, and their tripoli and other compositions are equally well known.

The Rockwell Furnace Company, New York, have opened an office in the Engineers' Building, Cleveland, Ohio, for the sale of furnaces for heat treatment, annealing, tempering, etc. The office will be in charge of Geo. B. Norcross, who will have associated with him Walter F. Johnson, formerly assistant treasurer of the King Bridge Company, Cleveland, Ohio, and E. W. Saunders of the Carbon Steel Company of Pittsburgh.

Voltite, the new electro-plating powder which was first described in THE METAL INDUSTRY last year, is advertised in this issue. This new method of plating without the use of dynamos, tank solutions or other equipment, has attracted a great deal of attention. The American Voltite Company, 225 West Thirty-ninth street, New York, are now prepared to furnish this powder for doing plating in gold, silver, nickel, tin and platinum and other finishes.

The Foundry and Machine Exhibition Company call attention in this issue to the desirability of reserving exhibition space at the Buffalo Convention as early as possible. The association is particularly anxious this year to interest manufacturers of polishing and plating equipment and supplies, as well as brass foundry and metal shop supplies, in exhibiting their goods before the thousands of visitors who operate polishing and plating plants in connection with their brass and aluminum foundries.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

METAL MARKET REVIEW

NEW YORK, June 10, 1912.

COPPER.

The "highly inflated copper prices" referred to in our review of a month ago appear today to have been established on a very solid basis and the buying movement during the month of May both for home consumption and for export has carried the copper market well into the 17-cent range of prices. The home buying during the month has been persistent and the demand for quick shipments on the part of consumers is sufficient evidence of a rapidly growing consumption of the red metal. The market today, as usual at the top of the advance, is apparently stronger at 17 cents and in better statistical position than it was at around 12 cents.

The exports were over 1,000 tons a day for the month, reported to date as 32,584 tons, or nearly 73,000,000 pounds, and the home deliveries are estimated at around 70,000,000 pounds. This means a further decrease in the stocks as published by the Copper Producers' Association.

The foreign statistics for the month make a very good showing and will help to scare the shorts and bring in more frightened consumers. The total visible supply stands at 44,590 tons against 49,780 tons a month ago, a decrease in the

stocks of 5,190 tons or 11,625,600 pounds during the month of May.

The market today is 17 to 17⅛ cents for Lake and 17 cents for Electrolytic, with casting brands at 16¾ cents. The sales of copper on the New York Metal Exchange for the first five months of this year amounted to close to 3,000,000 pounds against sales of 168,000 pounds for same period last year.

With a decrease of 15,450,386 pounds in domestic stocks, and a decrease in the foreign stocks of 16,374,400 pounds, making a total decrease of the world's visible supply of copper of 31,824,786 pounds, during the month of May the copper market is excited at 17½ cents and looks like 20. The domestic stocks on hand today (June 1) are equal to about 10 days' supply.

TIN.

The tin market has been very active in New York and considerable business was done on the New York Metal Exchange. The fluctuations have been wide and violent and anyone lucky enough to strike it right both ways must have made some good money. The market opened at 46.20, advanced to 47⅛ cents, and closed at 45½ cents.

The total visible supply at the end of May was 14,345 tons against 11,893 tons at the end of April and 15,938 tons a year ago. The increase in the visible of 2,500 tons in a month would ordinarily bring a decrease in price, but not so with tin, it seems to have a way of going just the opposite.

The market today is around 46½ cents for spot and is just as likely to be 46 cents tomorrow or even 45½. There is this to be noted, however, that the heavy trading on the New York Metal Exchange is evidently affecting the London market, and at times New York has certainly made the market for London. We do not have so much of the syndicate in London and the New York market has a chance to take the lead.

On the New York Metal Exchange 3,760 tons tin were dealt in so far during this year.

Traders on the Metal Exchange are getting scared about June tin and price has been run up to 47.25 paid for this delivery.

LEAD.

The lead market has been very dull and uninteresting, ruling around 4.15 to 4.20 in New York and at 4.05 to 4.15 in St. Louis. Trading on the New York Metal Exchange has been rather more active and 750,000 pounds were dealt in so far during this year.

SPELTER.

This metal has held very firm all the month at around 6.85 to 7 cents, New York, and 6.70 to 6.80, St. Louis. Spot New York delivery is quotable at 7 cents for carload lots.

The trading in this metal on the New York Metal Exchange has been very active, some 6,100,000 pounds were dealt in, making this market the leading center for spelter prices for the trade. During the first few days of June nearly 3,000,000 pounds have been traded, and the tip is that spelter is going to 7 cents St. Louis.

ALUMINUM.

With the foreign combination working together again the aluminum market has been firmer and prices advanced from 19½ cents a month ago to 22 cents, the highest and closing at 21½ cents. For round lots for importation this figure could probably be shaded.

ANTIMONY.

Prices are higher again, Cookson's at 8 cents, Hallett's at 7¾ and Hungarian grade at from 7 to 7¼ cents.

SILVER.

The market has ruled very steady at from 60⅛ the lowest to 61 cents at the close, with London at 28d.

QUICKSILVER.

This market has held very steady at $41 per flask for wholesale (100 flask lots) and $41.50 to $42 per flask for jobbing lots.

SHEET METAL.

Copper wire has been advanced ¾ cents to 17¾ cents base, Sheet copper is quotable at 22 cents base. All brass prices have been advanced. High sheet brass 17½ cents, low sheet brass 19¼ cents, making a general advance all around of ¾ cent per pound advance for the month.

Due to increased cost of copper, copper wire manufacturers have again advanced prices ¼ cent per pound as follows, f. o. b. mill, effective June 7:

Bare copper wire and cable	18.25	cents.
Magnet wire	19.50	"
Drawn copper rods, bars and strip	17.25	"
Copper in rolls	17.25	"
Copper annodes:		
Untrimmed	19.25	"
Trimmed	19.50	"

OLD METALS.

Old copper material has been helped along with the advance in copper, but there has been no boom or very much activity; prices are considerably higher than a month ago and there seems to be a little more doing.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

June 8, 1912.

Stocks of marketable copper of all kinds on hand at all points in the United States, May 1, 1912		65,066,029
Production of marketable copper in the United States from all domestic and foreign sources during May, 1912		126,737,836
		191,803,865
Deliveries:		
For domestic consumption	72,702,277	
For export	69,485,945	
		142,188,222
Stocks of marketable copper of all kinds on hand at all points in the United States, June 1, 1912		49,615,643
Stocks decreased during the month of May		15,450,386

MAY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	16.85	15.85	16.30
Electrolytic	16.75	15.75	16.20
Casting	16.50	15.70	16.10
TIN	47.15	45.40	46.20
LEAD	4.20	4.15	4.20
SPELTER	7.00	6.85	6.90
ANTIMONY (Hallett's)	7.75	7.75	7.75
SILVER	61⅜	60⅛	60.85

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February, 14½; March, 15; April, 16; May, 16⅜ cents.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY, 99 John street, New York. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds.

Metal Prices, June 10, 1912

NEW METALS.	Price per lb. Cents.
Copper—Pig, Bar and Ingot and Old Copper. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	17.10
Electrolytic, carload lots	17.00
Casting, carload lots	16.75
Tin—Duty Free.	
Straits of Malacca, carload lots	46.35
Lead—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.20
Spelter—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	6.90
Aluminum—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	25.00
100 lb. lots	20.00
Ton lots	21.50
Antimony—Duty 1½c. per lb.	
Cookson's cask lots, nominal	8.00
Hallett's cask lots	7.75
Chinese	7.25
Hungarian grade	7.25
Nickel—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.40 to .50
Manganese Metal—Duty 20 per cent	.90
Magnesium Metal—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
Bismuth—Duty free	2.00
Cadmium—Duty free	.90
Chromium Metal—Duty 25 per cent. ad val.	.98
Quicksilver—Duty 7c. per lb	.58
	Price per oz.
Gold—Duty free	$20.67
Platinum—Duty free	45.25
Silver—Duty free	.60⅛

Dealers' Buying Prices. Cents. per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
15.00 to 15.50	Heavy Cut Copper	16.00 to 16.50
14.75 to 15.00	Copper Wire	15.75 to 16.00
13.00 to 13.25	Light Copper	14.00 to 14.25
12.00 to 12.25	Heavy Mach. Comp	13.25 to 13.50
9.25 to 9.50	Heavy Brass	10.25 to 10.50
7.25 to 7.50	Light Brass	8.25 to 8.50
9.00 to 9.25	No. 1 Yellow Brass Turnings	10.00 to 10.25
10.50 to 11.00	No. 1 Comp. Turnings	11.50 to 12.00
3.50 to ——	Heavy Lead	—— to 3.75
4.75 to ——	Zinc Scrap	—— to 5.25
6.00 to 6.50	Scrap Aluminum, turnings	7.00 to 9.00
10.00 to 12.00	Scrap Aluminum, cast, alloyed	10.00 to -3.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.			Price per lb. Cents.
Silicon Copper, 10%	according to quantity		27 to 32
Silicon Copper, 20%	"	"	30 to 32
Silicon Copper, 30% guaranteed	"	"	32 to 34
Phosphor Copper, guaranteed 10%	"	"	22 to 25
Phosphor Copper, guaranteed 15%	"	"	24 to 30
Manganese Copper, 25%	"	"	35 to 40
Phosphor Tin, guaranteed 5%	"	"	49 to 50
Phosphor Tin, no guarantee	"	"	51 to 53
Brass Ingot, Yellow	"	"	11 to 12
Brass Ingot, Red	"	"	13 to 15
Bronze Ingot	"	"	14⅞ to 15¼
Manganese Bronze	"	"	18½ to 20
Phosphor Bronze	"	"	13 to 16
Casting Aluminum Alloys	"	"	17¾ to 22

Phosphorus—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 21.50 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 20 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9⅜ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7⅞ to 9⅜ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7⅞ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... **Base Price.**
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1½c. per lb. Cents per lb.
Carload lots, standard sizes and gauges, at mill ..... 8.65 less 8%
Casks, jobbers' prices 9¼
Open casks, jobbers' prices 9¾

Metal Prices, June 10, 1912

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.
In effect June 1, 1912, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16¼	$0.18	$0.19¾
Wire	.16	.18	.19¾
Rod	.16	.18¾	.20¾
Brazed tubing	.20¾	—	.24½
Open seam tubing	.19⅞	—	.22½
Angles and channels, plain	.20	—	.23

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.17½	$0.19¼	$0.21
Wire	.17¼	.19¼	.21
Rod	.17¼	.20	.22
Brazed tubing	.22	—	.25¾
Open seam tubing	.20⅞	—	.23¾
Angles and channels, plain	.21¼	—	.24¼

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

18.50 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	21c.	per lb. base
100 lbs. to 300 lbs. in one order	21½c.	" " "
Less than 100 lbs. in one order	23c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 21c. per lb.
Seamless Copper Tubing, 25c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	29	28	23	22	21	21	21	21	21	21	21	22	23	25	27	28

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
Sheet	$0.17½	$0.19½	$0.21
Wire	.17¼	.19¼	.21
Rod	.17¼	.20	.22
Brazed tubing	.22	—	.25¾
Open seam tubing	.20⅞	—	.24¾
Angles and channels, plain	.21¼	—	.24¼
1⅛ inch	22		24
1¼ inch	25		27
1½ inch	32		35
1⅞ inch	45		48
2 inch	56		60

Discount 50%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	18½c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	17½c. " "
" " " Rectangular sheets other than Sheathing	20c. " "
" " " Rod	17½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 26½c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.
Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... 3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including..... 12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	70	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19, B. & S. Gauge, inclusive				$0.60
6 "	" 19,	"	"		.70
9 "	" 19,	"	"		.85
12 "	" 19,	"	"		1.00
15 "	" 19,	"	"		1.15
16 "	" 19,	"	"		1.20
18 "	" 19,	"	"		1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.
For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.